# The Builder.

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## ILLUSTRATIONS.


Competition for Museum Extension and School of Science, Liverpool.—Design submitted by Mr. W. D. Caröe, F.R.I.B.A.:—
Perspective View ..... *Double-Page Ink-Photo.*
Detail Elevation ..... *Double-Page Ink-Photo.*
Plans ..... *Double-Page Photo-Litho.*
New Buildings, 24 and 25, King William-street, E.C.—Mr. Gerald C. Horsley, Architect ..... *Double-Page Photo-Litho.*

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## *American Methods of Warming and Ventilating.*

A VARIETY of concurrent circumstances have led in America to the practically universal abandonment of the open fire as a warmth producer and distributer. The intensity of the winter's cold, to which the great heat of summer and the dryness of the atmosphere make the American particularly susceptible, demands both more heat and the better distribution of heat than the open fireplace can effect. The susceptibility of the American leads him to desire a higher temperature within doors than that with which we are satisfied. He requires a minimum temperature of 70 deg. Fahr. when we are quite content with 60 deg., or even less. Then, again, to economise manual labour is the first aim of every true American. Any machine which, at a capital expenditure of 100*l.*, will save the cost of one unskilled labourer, is master of the field. Therefore, it is not surprising that various systems of apparatus which will supersede the open fire are regarded with favour amongst our shrewd cousins. It must not be forgotten, however, in making a comparison between English and American methods, that our national love of the open fire is not merely an instance of insular conservatism, but is based upon an instinctive, if sub-conscious appreciation of scientific fact. Heat rays from obscure or non-luminous sources have far less radiating power in our moist atmosphere than in the dry air of America, whilst those from a luminous open fire are relatively more effective. Hence the conditions in England give a greater advantage to our favourite method; those in America to radiation from non-luminous heated bodies. Even in England, however, the efficiency of the open fire is limited and its costliness considerable; therefore we may with advantage take cognisance of the results and the experimental efforts of our inventive rivals. The abolition of the open fire and the loss of its powerful assistance as a means of ventilation have naturally led to the substitution of other means of providing fresh air, and there is, consequently, much to learn from American methods of warming and ventilating.

In a couple of books recently published, the one by Professor Carpenter,* the other by Dr. Billings,† we have put before us, clearly and succinctly, the prominent methods now adopted in American practice. If we may take these two authors as reliable guides, it appears that American engineers are more disposed to base their methods on a scientific foundation than are the majority of the tradesmen who, over here, style themselves "heating and ventilating engineers"; but the two gentlemen to whom we are referring are scientific men, and possibly the tradesman in America is no better than he is here. American science in this department is based largely upon the work of Péclet, the truth and accuracy of whose observations and deductions will probably ever keep him in the forefront of heating scientists. Many interesting and valuable experiments have of late been made, however, in America, some of which confirm the results obtained by older investigators, whilst others supplement them in various practical directions. With many of these it is difficult to agree, as there is somewhat of a disposition to base conclusions upon investigations insufficient in number to completely define the connexion between cause and effect. Thus Professor Carpenter lays down the law that for the admission of fresh air and extraction of foul air the best results are obtained when the inlet is on the side near the top and the outlet is in the bottom and near the centre of the room. In the experiments on which this theory is based, six variations of the arrangement of inlet and outlet were tried: (1) air introduced at bottom (*i.e.*, through floor), discharged at top (*i.e.*, of side wall); (2) air introduced on side (wall), discharged at top (of side wall); (3) air introduced on side (half-way up wall), discharged on opposite side (half-way up wall); (4) air admitted on side (two-thirds up wall), discharged near bottom (of opposite wall); (5) air admitted at bottom (through floor), discharged near bottom (of side wall); (6) inlet near top (of wall), discharge near bottom (and near centre of floor). In the first five of these experiments the air current passed through the room, principally in the space above the breathing line; in the sixth with an even distribution throughout the room. Hence is deduced the law we have mentioned. It is also urged that the advantages of introducing warm air at or near the top of the room are: first, the warmer air tends to rise, and hence spreads uniformly under the ceiling; second, it gradually displaces other air, and the room becomes filled with pure air without sensible currents or draughts; third, the cooler air sinks to the bottom and can be taken off by a ventilating shaft. In our opinion, neither the experiments nor the deductions therefrom are sufficiently comprehensive. The very obvious condition, at least to an Englishman, of air admitted at the side near the bottom of the wall and discharged at the ceiling, does not appear to have been included in the experiments, whilst the deductions are evidently entirely contingent on the admission of the air at a high temperature, as is the usual American practice, and the use of electricity or other non-vitiating sources of artificial light. Vitiated air exhaled from the lungs is balanced in weight by pure air at 90 deg. Fahr. It is therefore imperative that the fresh air at the breathing line should be higher than this in temperature, to prevent the vitiated exhaled air rising and mingling with the stream of down-flowing fresh air, as it would do unless a forced air current under powerful control were used. The question of the relative moisture of English and American atmosphere is here again an important factor. An American likes to breathe air at 70 deg. Fahr. or even at 90 deg., but an Englishman does not. This is admitted even by Dr. Billings, who, in arguing in favour of a high temperature against the teaching of Leeds and Trélat, says: "There is abundance of oxygen in ordinary air at the temperature of 70 deg. Fahr., and a man's sensations while walking in air of this temperature, *provided it does not contain too much moisture*, are very satisfactory." The words we have italicised give the key to the whole question. It goes without saying that fresh air passing through a stratum in which gas lights are burning cannot avoid bringing the carbon oxides, acetylene, and other products of combustion into the respiratory atmosphere. For English practice, therefore, it may be

* "Heating and Ventilating Buildings." By Rolla C. Carpenter, M.S., C.E., M.M.E., Professor of Experimental Engineering, Cornell University. New York; John Wiley & Sons: London; Chapman & Hall.

† "Ventilation and Heating." By John S. Billings, A.M., M.D. New York: *The Engineering Record.*

regarded as incontrovertible that, save in a few exceptional instances, an upward current of the fresh air is preferable.

As regards the amount of fresh air to be provided for each individual, a minimum of thirty cubic feet of air per minute is generally admitted to be necessary, and this figure has received legal approbation in Massachusetts, where this amount is required by law for school buildings.

It appears that by far the most usual method of artificial heating in America at the present time is by means of steam, though hot water, and, to a limited extent, hot air, are also employed. The reasons for the preference of steam heating are instructive. First, the architects rely upon the tradesmen for details, and these latter prefer steam because it is easier to plan and set up a steam-heating apparatus which will work than to do the same with a hot-water apparatus, and mistakes in calculation or planning may, to a considerable extent, be overcome by increasing the pressure in the boiler. Then, as the radiating surfaces in steam-heating are kept at a higher temperature than with hot water, smaller and more compact radiators may be used. Add to this that steam boilers and fittings, in a country which is the paradise of machinery, can be readily obtained, that the plant for a steam-heating apparatus is cheaper than for a hot-water one, and that it is easier to "scamp" work with steam than with hot water, and quite sufficient reasons exist for the tradesman's preference. As a matter of fact, steam-heating apparatus has several disadvantages; it requires constant attention; it is more difficult to regulate; it is liable to noise or "water-hammer" if improperly constructed, and it is somewhat more dangerous than hot water. Although, for the reasons stated, steam is more generally used, it is admitted that, save where great heat has to be provided or where power is also required, hot water is generally superior. The first cost of steam heating is generally (in America) considerably less, but hot water is more economical in operation, as is shown by a careful series of experiments made at the Massachusetts Agricultural College by Professor S. T. Maynard, and also by others made under the direction of Professor L. R. Taft at the Michigan Experiment Station. Other advantages of hot water are that the heat is somewhat less in intensity and more pleasant, and that the temperature is more easily regulated. Hot-air heating, where the air is moved by natural draught, is found to be suitable only to the smaller sizes of dwelling houses, where the heat does not need to be carried to a greater horizontal distance than 15 or 20 ft. The hygienic drawbacks of hot-air heating are recognised, especially as the motive for this system, cheapness, often leads to the use of a heater too small in size, and therefore liable to be over-fired.

The preference for steam heating has probably been largely instrumental in leading to the almost exclusive use of wrought-iron welded pipe for hot-water as well as steam heating. Cast-iron pipe, although formerly largely used, is at present employed only to a limited extent in greenhouse heating. Steel pipe as at present made is inferior, being harder to cut, not so perfectly welded, and more liable to split. An admirable feature in the trade is that practically all manufacturers make their pipes, and the numerous fittings required, to standard sizes and patterns.

The use of wrought iron piping facilitates a combination sometimes adopted of hot-water and steam heating, the hot-water for moderate temperature, and the steam for extremely cold weather. Such a combination requires the selection of a heater or boiler which will answer for either purpose, the construction of a system of piping which will permit the circulation of either steam or hot water, and the use of radiators which are adapted to both kinds of heating.

Radiators are now practically universal, the diffusion of heat by means of large cast-iron pipes being obsolete. This is largely due to the introduction of wrought-iron pipes and to the desire of economising space in the room and improving the appearance. The radiators are generally of cast-iron, and for both hot water and steam are very similar in form, the essential difference being that those for hot water have a horizontal passage at the top as well as at the bottom. Radiators are employed in three different ways, and are termed direct, indirect, and direct-indirect. Direct radiators stand within the room to be warmed and have no definite air supply; they are thus popularly presumed to act by radiation, but there can be little doubt that a great part of their work is done by the convection of their heat by the circulation of the atmosphere of the apartment. Indirect radiators are placed outside and below the floor of the room to be warmed, to which their heat is conveyed by a current of air passing over them and leading directly to the room. The amount of the incoming air, and hence its temperature, is regulated by dampers. Direct-indirect radiators are placed within the room, but have a fresh air supply from outside, which passes through and over them, becoming warmed in its passage. Direct radiators are found most effective in warming, but, of course, there is less active ventilation than in either of the other two classes.

The general use of steam has directed special attention to those details on which the success of this method of heating depends, so that we find many ingenious forms of such things as automatic air-valves, steam traps, and safety valves. In boilers there are many varied forms, principally in the two groups of tubular and sectional boilers. These are set sometimes in brickwork, but for heating-boilers portable settings are almost universal. As anthracite coal is very largely used in the States, self-feeding magazine boilers have been frequently used, but it appears that there is little advantage, if any, in the practice. For burning soft or bituminous coal, magazines are, of course, unsuitable. Main steam pipes are usually insulated to prevent loss of heat, and the most usual and effective covering is made by wrapping three or more layers of asbestos paper, each about $\frac{1}{16}$ in. thick, on the pipe, covering with a layer of hair felt $\frac{3}{4}$ in. in thickness, and wrapping the whole with canvas or paper. This covering has an effective life of about five years on high-pressure steam pipes, and ten to fifteen years on low-temperature pipes, whilst its efficiency is measured by a loss of only about 15 per cent. of that from a naked pipe.

Where steam power is required for engine driving, considerable economy is possible by utilising the exhaust steam for heating. This method requires the arrangement of a system of piping having such proportions as will make little or no increase in back pressure on the engine, and will provide for using an intermittent supply of steam; provision for removing the oil from the exhaust, since this will interfere materially with the heating capacity of the radiating surfaces, and provision against accidents by the use of a safety or back pressure valve so arranged as to prevent damage to the engine by sudden increase in back pressure.

Forced blast systems of warming by hot air are employed, and fans of both the centrifugal and axial types are used. As a means of warming, these systems are costly, but the amount of ventilation obtained more than compensates for the cost.

Electricity has been employed to a limited extent for warming, but the cost is prohibitive in almost all cases unless the current can be very cheaply obtained. To burn coal simply to make electricity for warming purposes is found to cost fifteen to twenty times as much as the same amount of heat by steam or hot-water methods.

It is interesting to find that in America the artificial ventilation of hospitals has been carried out in a thorough manner, and appears to meet with the approval of the medical faculty. Leading examples are the Barnes Hospital, at the Old Soldiers' Home near Washington, and the Johns Hopkins Hospital at Baltimore. In the former instance the warming is effected by hot water, the coils being placed in fresh-air chambers in the basement, each coil being fitted with a valve which enables the temperature of each fresh-air inlet to be regulated to suit the feelings of patients near them. Natural ventilation by open windows is used when possible; but when this is insufficient or impracticable, fresh air is supplied by ducts, and propelled by a fan. The foul air is removed by aspiration in chimneys 96 ft. high, and 4 ft. 4 in. by 5 ft. 8 in., in which are boiler-iron flues, 2 ft. in diameter, that carry off all the products of combustion from the hot-water and steam-boiler furnaces as well as from the kitchen range. Each flue has a basket grate at its base, in which a fire can be built when the furnaces are not acting. The foul-air outlets from the wards are placed both in the centre of the floor and in the centre of the ceiling, so that the vitiated air can be extracted either above or below.

Experimentally, double sets of inlets have been arranged in some of the wards, half 10 in. below the ceiling and half 10 in. above the floor; but experience has shown that the downward current of fresh air is liable to cause discomfort to the patients. In the Johns Hopkins Hospital the use of aspirating flues for extraction of the foul air is adopted, and the foul-air exits from the wards are placed in the central axis of the ceiling, and also under the foot of each bed; the former being used in summer and the latter in winter. Warming is effected as in the Barnes Hospital, by hot water.

In the ventilation of large halls a varied practice is seen; thus in the New York Music Hall, founded by Andrew Carnegie, the fresh air is forced in by fans at the top of the room, and withdrawn from the bottom, exhaust fans being also employed. The Metropolitan Opera House in New York, on the other hand, has a plenum system, the fresh air being forced in at the bottom of the

house and at the front of each tier, and allowed to pass off at the top without other aspirating power than that of the gas lighting. In the Madison-square Theatre, again, the ventilation is by upward current, but fans are used both for propulsion and for aspiration.

As in England, few churches in America have adequate ventilation. There are, however, a few exceptions, such as the Fifth Avenue Presbyterian Church, New York, where a fan is employed to force in fresh air below the benches after it has been warmed over steam pipes. The result is not altogether satisfactory, as unpleasant draughts have been experienced, and there is a tendency to close the registers, which are under the control of the occupants of the pews.

In the ventilation of schools, the recent tendency in America is towards mechanical systems by means of fans propelling warm air into the rooms, and in some instances the warming power of the air is supplemented by direct radiators. Aspirating shafts are an older device as regards schools, and are still used, while in other instances fans are employed for extraction. The Massachusetts law, to which we have already alluded, is worthy of imitation in our own Education Department, and will doubtless influence school ventilation generally throughout the States.

## A RESTORATION OF THE MAUSOLEUM AT HALICARNASSUS.—II.*

BY MR. J. J. STEVENSON, F.S.A.

THE data which we have for a restoration of the Mausoleum are, first, the descriptions and dimensions given by old writers—Pliny, Hyginus, and Martial, and the story of its destruction by De la Tourette and the knights of Rhodes to build the Castle of Budrum.

Pliny's statement in his Natural History, Book 36, c. 5, written about A.D. 50, is as follows:—

"Scopas habuit æmulos eadem ætate Bryaxin et Timotheum et Leucharem de quibus simul dicendum est, quoniam pariter cælavere Mausoleum. Sepulchrum hoc est ab uxore Artemisia factum Mausolo Cariæ regulo, qui obiit Olympiadis centesimæ sextæ anno secundo. Opus id ut esset inter septem miracula ii maxime artifices fecere. Patet ab Austro et Septentrione sexagenos ternos pedes, brevius a frontibus, toto circuitu pedes CCCCXI; attollitur in altitudinem viginti quinque cubitus; cingitur columnis triginta tex. Pteron vocavere. Ab Oriente cælavit Scopas, a Septentrione Bryaxis, a Meridie Timotheus, ab Occasu Leochares; priusque quam peragerint, regina obiit. Non tamen recesserunt nisi absoluto jam id gloriæ ipsorum artisque monumentum judicantes; hodieque certant manus. Acessit et quintus artifex. Namque supra Pteron pyramis altitudine inferiorem æquavit, viginti, quatuor gradibus in metæ cacumen se contrahens. In summo est quadriga marmorea quam fecit Pythis. Hæc adjecta centum quadraginta pedum altitudine totum opus includit."

Mr. Oldfield translates this as follows:—

"Scopas had as rivals in the same age Bryaxis and Timotheus and Leochares of whom it is right to speak together, since they equally adorned with sculpture the mausoleum. This is the sepulchre made by his wife Artemisia for Mausolus, ruler of Caria, who died in the second year of the hundred and sixth Olympiad. That that work should rank among the seven wonders (*i.e.* of the world) those artists mainly brought about. It extends on the south and north to 63 ft. to a shorter space on the fronts, in its entire circuit to 411 ft.; it rises to its height by 25 cubits; it is surrounded by thirty-six columns. They called it the Pteron. On the east Scopas sculptured it, on the north Bryaxis, on the south Timotheus, on the west Lecchares; and before they had completed it the Queen died. They did not, however, withdraw, unless when it was quite finished, judging it to be a monument to the glory of themselves and of Art; and to this day their hands appear in competition. There came in also a fifth artist. For above the Pteron a pyramid equalled in height the one below, contracting itself by twenty-four steps into the summit of a meta. On the top is the marble quadriga which Pythis made. This having been added includes the whole work in a height of 140 ft."

Hyginus, a contemporary of Vitruvius, says, in a passage which Mr. Falkner claims to have found: "Monimentum regis mausoli lapidibus lychnicis altum pedes LXXX.; circuitus pedes MCCCXL."

Martial's words are as follows:—

"Ære nec vacuo pendentia mausolea
Laudibus immodicis Cares in astra ferant."
"*De Spectaculis*," *Epig. I.*

Guichard, in a work published at Lyons in 1581, "Funerailles et diverses manières d'ensevelir des Romaines, Grecs, &c.," gives the following story:—

"In the year 1522," he says, "when Sultan Solyman was preparing to attack Rhodes, the Grand Master, knowing the importance of the Castle of St. Peter, and being aware that the Turks would seize it easily at the first assault, sent some knights thither to repair the fortress and make all due preparations to resist the enemy. Among the number of those sent was the Commander de la Tourette, a Lyonnese knight, who was afterwards present at the taking of Rhodes, and came to France, where he related what I am now about to narrate to M. D'Alechamps, a person sufficiently known by his learned writings, and whose name I mention here only for the purpose of publishing my authority for so singular a story.

When these knights had arrived at Mesy (Budrum), they at once commenced fortifying the castle; and, looking about for stones wherewith to make lime, found no more suitable or more easily got at than certain steps of white marble, raised in the form of a terrace (perron) in the middle of a level field near the port which had formerly been the great Place of Halicarnassus. They therefore pulled down and took away these marble steps, and, finding the stone good, proceeded, after having destroyed the little masonry remaining above ground, to dig lower down, in the hope of finding more.

In this attempt they had great success, for in a short time they perceived that the deeper they went the more the structure was enlarged at the base, supplying them not only with stone for making lime but also for building.

After four of five days, having laid bare a great space one afternoon, they saw an opening as into a cellar. Taking a candle, they let themselves down through this opening, and found that it led into a fine large square apartment, ornamented all round with columns of marble, with their bases, capitals, architrave, freize, and cornices engraved and sculptured in half-relief. The space between the columns was lined with slabs and bands of marbles of different colours, ornamented with mouldings and sculptures in harmony with the rest of the work, and inserted in the white ground of the wall, where battle scenes were represented in relief.

Having at first admired these works, and entertained their fancy with the singularity of the sculpture, they pulled it to pieces, and broke up the whole of it, applying it to the same purpose as the rest.

Besides this apartment, they found afterwards a very low door, which led into another apartment, serving as an antechamber, where was a sepulchre, with its vase and helmet (tymbre), of white marble, very beautiful, and of marvellous lustre. This sepulchre, for want of time, they did not open, the retreat having already sounded.

The day after, when they returned, they found the tomb opened, and the earth all around strewn with fragments of cloth of gold, and spangles of the same metal, which made them suppose that the pirates, who hovered along this coast, having some inkling of what had been discovered, had visited the place during the night, and had removed the lid of the sepulchre. It is supposed that they discovered in it much treasure.

It was thus (adds this quaint old writer), that this magnificent tomb, which ranked among the seven wonders of the world, after having escaped the fury of the barbarians, and remained standing for the space of 2,247 years, was discovered and destroyed to repair the Castle of St. Peter, by the Knights of Rhodes, who immediately after this were driven completely out of Asia by the Turks."

But these notices could give us no certainty as to the form of the building without the actual remains of it (only too few, but absolutely authentic so far as they go), which Sir Charles Newton discovered on its site. These consist of the Order complete, the column with its architrave, frieze and cornice, the capital of one of the columns at the angles of the building, a marble beam which may fix the width between the exterior range of columns and the wall or columns inside them, one of the lacunaria, or ceilings between the columns, some stone steps of the pyramidal roof covering, including four angle stones, some steps of steeper gradient, fifteen statues of lions, all with their heads turned outwards as if to guard the sepulchre, remains of the quadriga which crowned the building, including portions of two horses, the bronze bit of one still in its mouth, a wheel of the chariot, the statue of Mausolus practically complete, and of Artemisia holding the reins, which stood together in it, torsos of a colossal horse in violent action and its rider, and of a colossal figure seated on a throne, the dress the same as on the figure of Mausolus, and some torsos of statues over life size.

The problem is to construct the building out of these, so far as they will go, in accordance with the descriptions and dimensions which have come down to us.

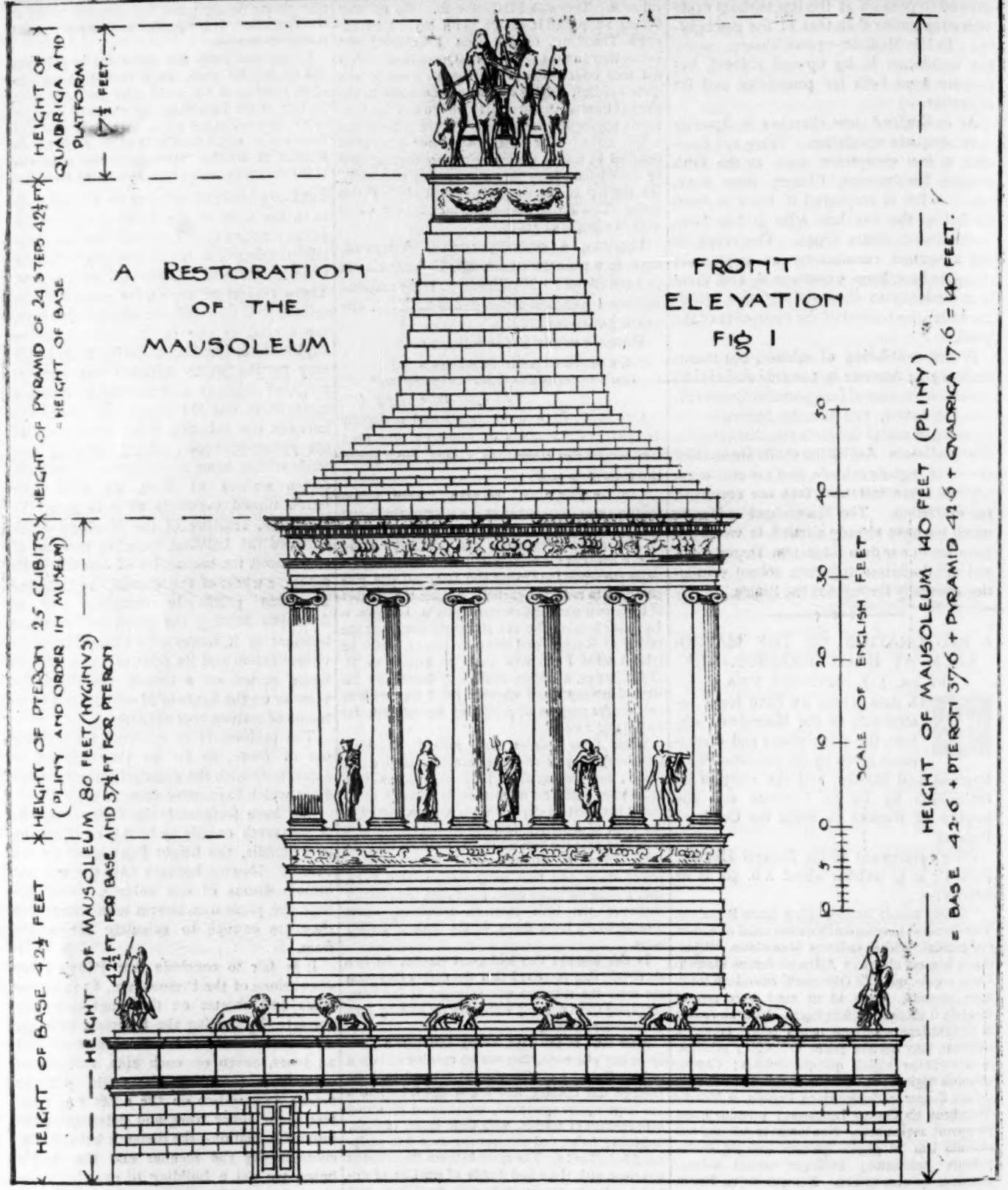
We have fortunately the Order complete. It measures exactly 37 ft. $2\frac{3}{16}$ in. (English), or 25 cubits, the height Pliny gives for the Pteron. Newton brought only the top and bottom drums of one column, though he says the place was strewn with drums, but they are enough to calculate the height from.

It is fair to conclude that Pliny's other dimensions of the Pteron—viz., 63 ft. on the sides and shorter on the front—are also correct. By ranging the thirty-six columns, as Cockerell does, in two rows, an outer and an inner, seven on each side, and six on each front (counting the angle columns twice), twenty-two on the outer and fourteen in the inner rows, and determining the intercolumniation—the distance between the columns—by the lacunar and the marble beam, we get a building of exactly Pliny's dimensions, with a space—not a column—in the centre of the fronts, as is proper in Greek buildings.

These dimensions, got from the remains, give the length of Pliny's foot as $11\frac{7}{8}$ in.; for 37 ft. $2\frac{3}{16}$ in., the height of the order as we have it, divided by 25 (the number of cubits Pliny says was the height of the pteron) gives $17\frac{3}{16}$ in. as the length of his cubit, which (a cubit being a foot and a half) makes the length of his foot $11\frac{7}{8}$ in., or $\frac{1}{8}$ in. less than our English foot.

The intercolumniation or distance from centre to centre of the columns we find from the remains was 9 ft. $9\frac{1}{4}$ in. (English). This multiplied by six, the number of the spaces on the sides according to Cockerell's arrangement, is 58 ft. $7\frac{1}{2}$ in. Adding 3 ft.

* Being portions of a paper, showing its main argument, read before the Society of Antiquaries of London on May 7, 1896.


A RESTORATION OF THE MAUSOLEUM
FRONT ELEVATION
FIG 1
HEIGHT OF PYRAMID OF 24 STEPS 42½ FT = HEIGHT OF BASE
HEIGHT OF QUADRIGA AND PLATFORM 17½ FEET.
HEIGHT OF PTERON 25 CUBITS (PLINY AND ORDER IN MUSEUM) = 37·6
HEIGHT OF MAUSOLEUM 80 FEET (HYGINUS) = 42·6 + PTERON 37·6 + PYRAMID 42·6 + QUADRIGA 17·6 = 140 FEET.
HEIGHT OF BASE 42½ FEET
HEIGHT OF MAUSOLEUM 42½ FT FOR BASE AND 37½ FT FOR PTERON
= BASE 42·6
0 10 20 30 40 50
SCALE OF ENGLISH FEET

5 in., the diameter (measured from the columns in the Museum at their base) of the two half columns at the end of the colonnade, gives for the length of the colonnade 62 ft. and half an inch. Adding $1\frac{7}{8}$ in. at each end, $= 3\frac{3}{4}$ in. for the assumed projection of the base, gives 62 ft. $4\frac{1}{4}$ in. (English) for the length of each side of the sepulchre, which is equal to 63 of Pliny's feet of $11\frac{7}{8}$ in. (English).

| | Ft. | In. |
|---|---|---|
| Length of colonnade at base of columns ... | 58 | $7\frac{1}{2}$ |
| Add diameter of two half columns at end ... | 3 | 5 |
| | 62 | $0\frac{1}{2}$ |
| Add assumed projection of base at each end | | $3\frac{3}{4}$ |
| Length of side of monument in English feet | 62 | $4\frac{1}{4}$ |

Pliny's feet being each $\frac{1}{8}$ in. shorter, $62 \times \frac{1}{8}$ in. $= 7\frac{3}{4}$ in., which, being added, makes the side of the monument 63 of Pliny's feet.

This arrangement, giving six intercolumniations on the sides, gives five on the fronts, which Pliny says were shorter, and makes their length 53 ft. $1\frac{1}{2}$ in. mausoleum feet, or 52 ft. 7 in. (English).

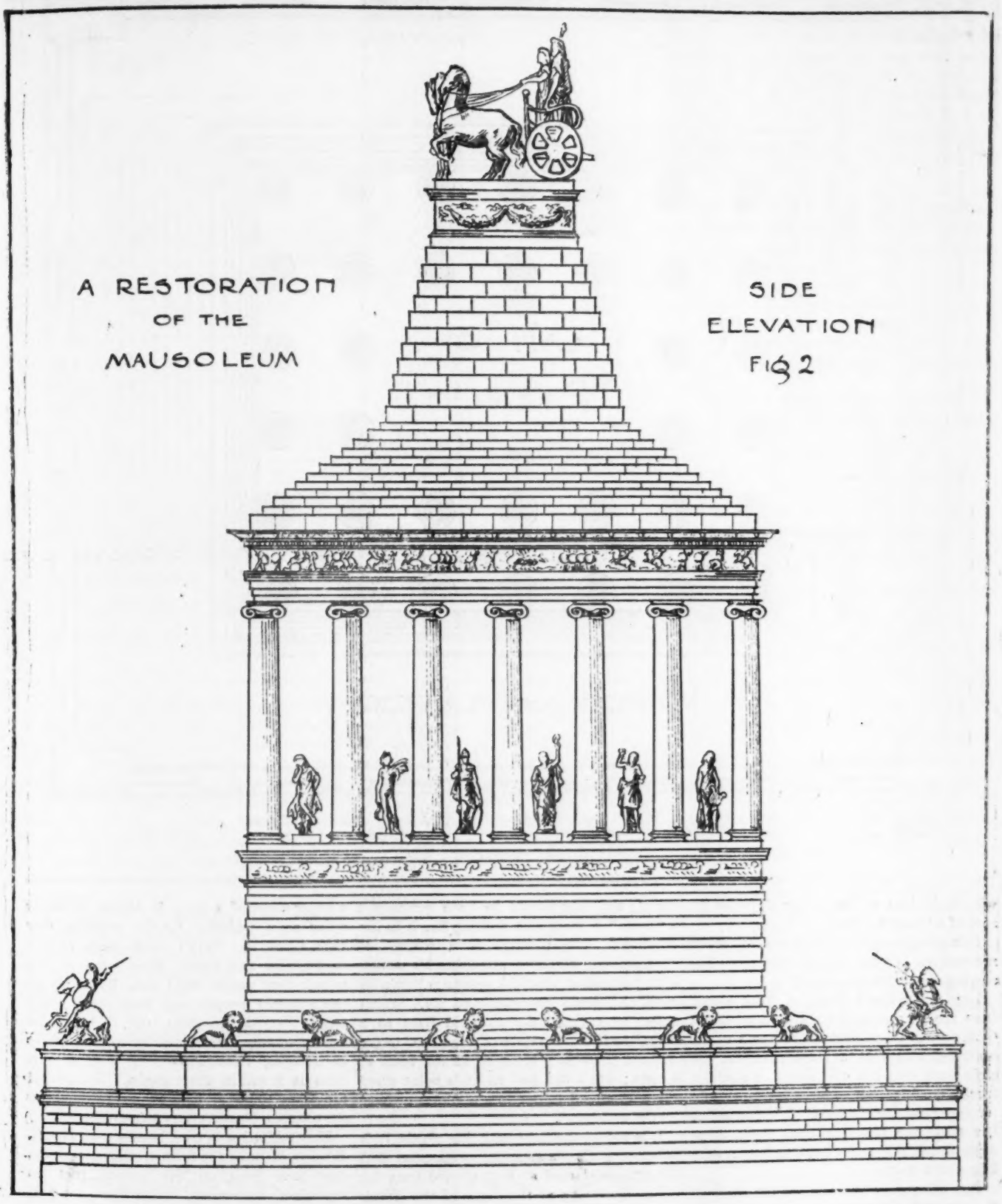
I believe a foot of $11\frac{7}{8}$ in. is not found in any other ancient buildings, but there may have been as many different feet in these times as there were, and still continue in use, in different districts of France and Germany, even after the French metre has been adopted as the government standard. The slight difference of $\frac{1}{8}$ of an inch in the length of the foot does not affect the general design or the proportions of the parts; it would be imperceptible in the drawings, and I shall therefore, for convenience sake, use the English foot as a measure in attempting the restoration.

Cockerell's arrangement of the thirty-six columns is that which everyone adopted as the meaning of Pliny's words, till the discovery of the broad flat steps of the pyramidal roof compelled the restorers to enlarge the building to find space for the twenty-four broad steps of the pyramid.

This low flat pyramid jars on our preconceived ideas, but we must accept it as

A RESTORATION OF THE MAUSOLEUM

SIDE ELEVATION FIG 2



absolutely proved by the remains. I tried to believe that these flat steps might have been steps forming the base of the monument, but the ingenious care taken to prevent water getting through them proves that they must have formed a roof-covering over some part of the monument which had to be kept dry.

The edge of each stone at its junction is raised in a ridge a quarter of a circle in section, which, fitting close to the similar quarter circle on the stone next to it, forms a roll like the rolls on a flat lead roof, preventing any water from lying on the joints and getting through. And this ledge is carried round the back of each step, a hollow being made in the bottom side of the covering stone to receive it, thus preventing any water penetrating through the roof at the back of each stone. The ledges at the back, and the grooves in the stone above them to fit them, as well as the draft lines at the front, show the position in which each stone was placed on the one below it, and absolutely determine the slope of Pliny's "pyramid" to be that adopted in Smith's and Pullan's restoration.

The corner stones in the pyramid, of which there are four in the Museum, prove that its contiguous sides rose at different angles; the steps on one side have a "tread" of 1 ft. 9 in., on the other of 1 ft. 5 in., both rising 11¾ in. on the face, making in one case an angle of 29½ deg., and in the other 35 deg. These are not usual angles for a pyramid, and on some contemporary and older coins and medals there are representations of tombs with steep pyramidal roofs, such as Cockerell adopted in his restoration. But the slope given by the steps in the Museum is the usual slope of the roofs of Greek buildings; and the remains of the architecture, as well as of the sculpture, prove that the building was Greek in design. The architects, whose names show that they were Greeks, while compelled to accept the traditional form of a pyramid for the tomb, may have lowered its pitch in conformity

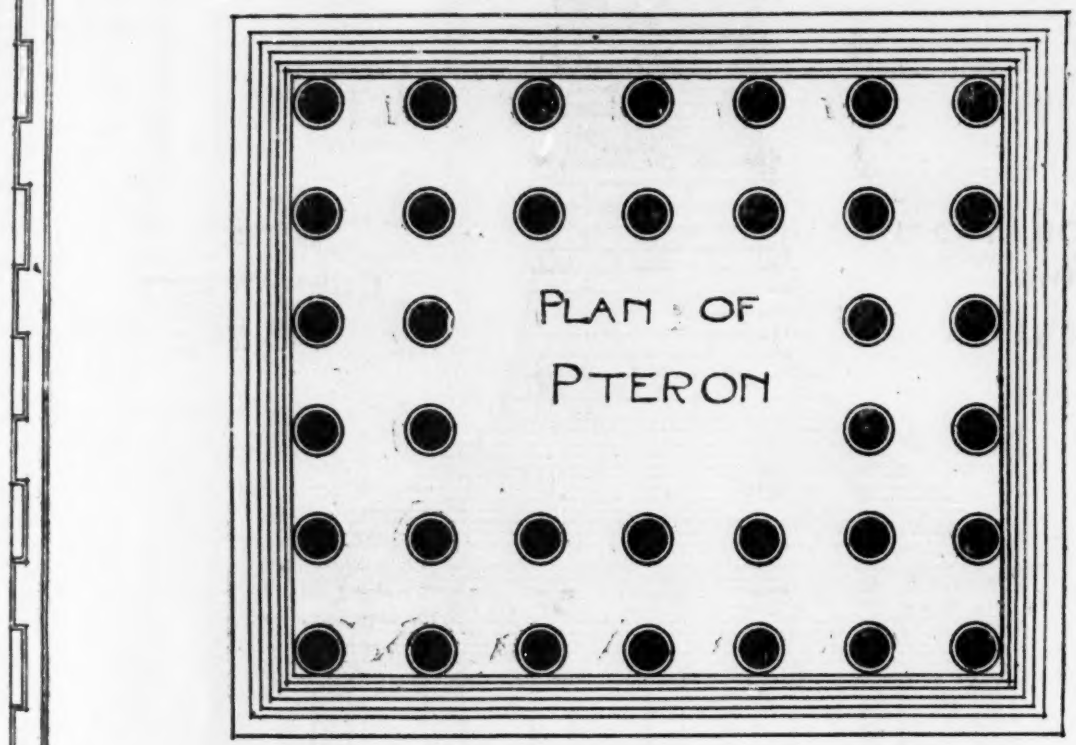



Fig 3

with their ideas of the proper slope for the roof of a Greek building.

One thing is certain, that of any attempted restoration of the mausoleum this flat-sloping roof must form a part.

But the pyramid rising at these slopes from the four sides from a base of about 63 ft. (which Pliny gives as the length of the building) meets in a point at about the eighteenth step, not only giving no platform for the quadriga, but no place in the pyramid for the remaining six steps. It is this which has made the restorers, since these steps were found, make the building larger than Pliny says it was.

But Pliny does not say that the steps of the pyramid, "in metæ cacumine se contrahens," were all of the same form and dimensions; the words rather imply the contrary, and there are among the remains in the Museum several higher steps with narrow treads, for which restorers can find no suitable place in the pyramid, or anywhere in the building.

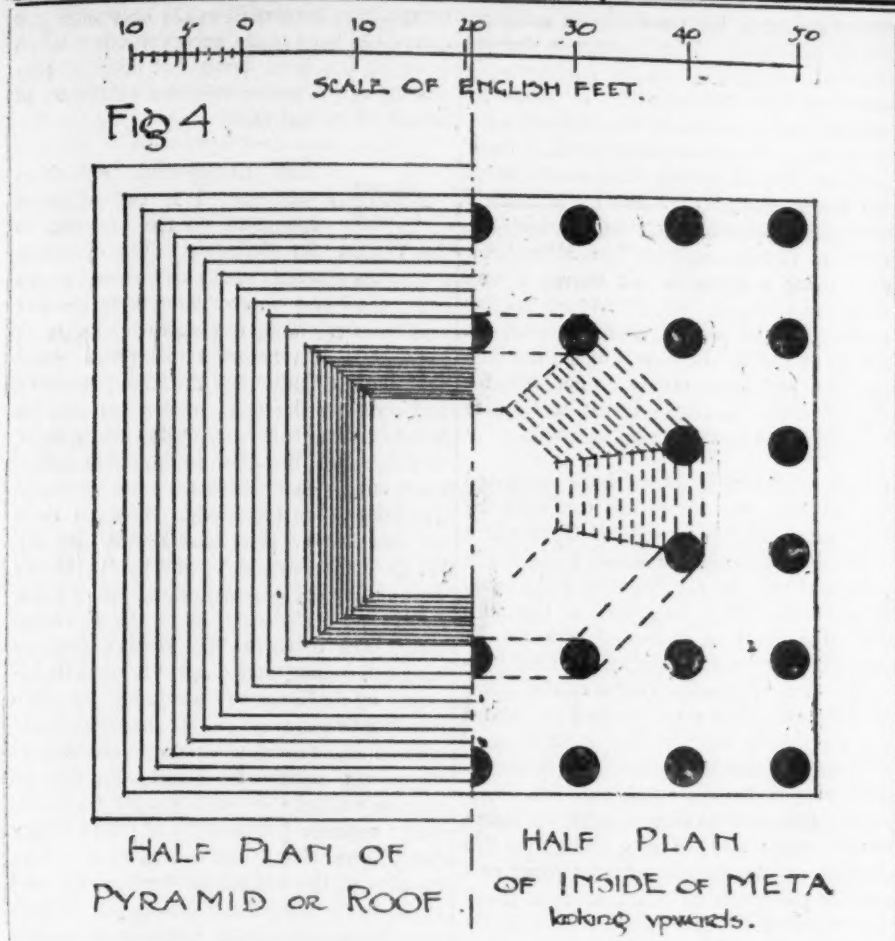
May not these, or similar steps now lost, be the steps of the "meta" he speaks of? The restorers all hitherto ignore his assertion that the pyramid contracted itself, ending in a "meta." We know what a meta or goal in the chariot races was like; a high steep cone, like a pine-cone in form; in a Roman circus sometimes an obelisk, square-sided—which may have been what Pliny was thinking of; and why should he have mentioned a "meta" if there was nothing like it in the building? The passage is a marvel of conciseness. He does not waste his words. If he had meant what the restorers think, he could and would have conveyed his meaning better by saying "the pyramid rises to a point," as it is the nature of a pyramid to do, without needlessly bringing in the form of a meta; and it did not end in a point when Pliny described it, but in a platform or base for the quadriga*.

It is not inconsistent with his words, it is rather their simple meaning, to suppose that the pyramidal roof at first started from the top of the Order at the slope of the flatter steps we have, and then shot up at the steeper slope of a meta in higher, narrower steps as a pedestal for the quadriga (see Figs. 1 and 2). Pliny's words seem exactly to describe this form. How many of the twenty-four steps were flat, belonging to the pyramid proper, and how many steep steps formed the meta, can, I think, be approximately determined by considerations of building construction. A roof of this form is found in other tombs. The roof of the Lion tomb at Cnidus, as restored by Sir Charles Newton, has a form like it.

Mr. Oldfield, it is true, rejects it as any indication of what the form of the mausoleum may have been, on the ground that no sepulchral monument earlier than B.C. 353, the probable date of the Mausoleum, can be taken as having influenced its form, "because," he says (p. 309 of his essay), "its architectural design must have had some notable individuality, some exceptional elegance of form, or ingenuity of composition, which no less than its size and rich ornamentation distinguished it from the ordinary type of tombs to which the Greeks were accustomed in the middle of the fourth century."

We are indebted to Mr. Oldfield, in developing this view, for an interesting and valuable description of tombs previous to the date of the Mausoleum, but I think we may believe that earlier buildings influenced its form and construction.

* "Cacumen" is used by Pliny and other writers for the top or end of things. In his "Natural History" (Book XI., Section 220), Pliny uses the word for the ends of the limbs of the body, "Arteruarum pulsus in cacumine maxime membrorum evidens." Again, in his "Natural History" (Book X., Section 151), he uses it for the end of an egg, "Si contra lumen cacumine ovorum apprehenso una manu purus perluceat color sterilia estimantur." Quintus Curtius, who wrote in the first century A.D. a history of Alexandra, describes a rock (VIII., 39, 6), "Petra in metæ modum erecta est cujus ima spatiosiora sunt altiora in artuis coiunt summa in *acutum* cacumen exsurgunt." This proves that "cacumen" is not always a *sharp* point. A common use is for the tops of trees. Columella, a writer on agriculture about A.D. 50 uses the word for the tops of fig trees, pear trees, and apple trees. These quotations, for which I am indebted to Mr. Neil, of Pembroke College, Cambridge, go to show that Pliny's words, "Pyramis in metæ cacumen se contrahens," may mean a pyramid contracting itself into and ending in a meta




A pyramid, as a form for a tomb, was certainly earlier not only in Egypt, but in Caria, and the tradition of the country and the race may have imposed on the Greek architects this form which their innate sense of art made suitable for their Greek building; and we may, I think, take the Lion tomb, earlier though it be, with its pyramid and meta-like termination supporting sculpture, as corroborative evidence that the mausoleum roof may have had a similar form. It is better evidence if this form for the roof, besides being what Pliny seems to describe, satisfies his other dimensions and removes the difficulties which have troubled the Restorers.

The evidence in a case like this is cumulative; if it all agrees it is a strong presumption, one may almost say proof, that each part of it is true.

It has been the fashion to sneer at Hawksmoor for his idea that his steeple of St. George's, Bloomsbury, was a reproduction of the apex of the Mausoleum, *mutatis mutandis*, with, instead of the chariot group, King George as St. George on the summit. He has evidently tried to follow Pliny's description. The steeple consists of twenty-four steps of various kinds and heights; its height is 146 ft., which, if he took Pliny's foot as larger than the English foot, may represent Pliny's height of 140 ft. If I am right, Hawksmoor's architectural insight may have realised, under his conditions, Pliny's description, and forestalled the discovery of the marbles and the critical emendations of the text.

Let us take as a working hypothesis the two slopes which the marbles give us, of a flat pyramid supporting a tall meta, and try whether Pliny's description and dimensions accord with it. We have first to determine the height of the roof consisting of a low pyramid with a meta rising from it. I think Pliny gives us this. It is probable that he would, since he gives the other heights. "Above the Pteron," he says, "a pyramid contracting itself in twenty-four steps 'in metæ cacumen' equalled or equals" (I don't think it matters which reading we adopt) "the lower height" or "lower part in height."

The simple and apparently obvious meaning is that the pyramid above the Pteron, which he had just said was 25 cubits high, equalled in height the part below the Pteron: that the roof and the base of the sepulchre were equal in height. Mr. A. S. Murray doubts if the words can bear this meaning, but other scholars whom I have consulted, Mr Neil, and Mr. Stewart, of Christ Church, Oxford, assure me that it can.

Let us try what results this gives as to the heights of the base and roof of the monument. "On the summit," he says, "is a marble quadriga, the addition of this made the height of the entire work 140 ft." If we subtract from 140 ft. the heights of the Pteron and of the quadriga, the remainder, divided by two, will give the heights respectively of pyramid and of base. The Pteron is 25 cubits or 37½ ft. high, which is within an inch or two the height of the Order as set up in the Museum. We can get approximately the height of the quadriga.

The statue of Mausolus, which stood in the chariot, is 10 ft. 2 in. high; the bottom of the chariot was, say, 8 in. thick, resting on the axle, say, 10 in. thick; the wheel measures 7 ft. 6 in. in diameter, making together 8 ft. 4 in., the half of which, viz., 4 ft. 2 in., is below the centre of the axle. These added together give—

| | Ft. | In. |
|---|---|---|
| Statue... ... ... ... | 10 | 2 |
| Chariot bottom ... ... | 0 | 8 |
| Half of wheel and axle ... | 4 | 2 |
| | 15 | 0 |

and make the height of the quadriga from the lower edge of the wheel 15 ft. Sir Christopher Wren had guessed it at 15 ft. The platform, formed of great stones, supporting the quadriga was, say, 2 ft. 6 in., making the total height of the quadriga 17 ft. 6 in. Subtracting that and the Order, = 37 ft. 6 in., from Pliny's total of 140 ft., the remainder is 85 ft., which, equally divided between roof and base, gives 42 ft. 6 in. for the height of each.

There is a singular confirmation of this hypothesis. The statement of Hyginus that the Mausoleum was 80 ft. high has hitherto been unmeaning. Newton and Pullan dismiss it from consideration as incompatible with Pliny's dimensions. Mr. Fergusson suggests that for feet we should read cubits—Babylonian cubits—as Mausolus was a satrap of the Babylonian monarch, and 80 Babylonian cubits are equal to the 140 ft. of Pliny.

This is certainly ingenious—perhaps too ingenious; for that Hyginus, writing in Latin for Romans, should for this one dimension use Babylonian cubits, which it is unlikely his readers knew anything about, while his other dimensions in the same passage are in feet, which they understood, is improbable; and Mr. Oldfield properly rejects the emendation as having no authority from the manuscripts.

But no emendation is necessary—Hyginus is quite right. The Mausoleum was 80 ft. high, if I am right in my reading of Pliny's words; and it agrees with Pliny's dimension of 140 ft. for the whole building, including the quadriga with the statue. Pliny's height of 37½ for the Pteron, added to the 42½ ft. which we found for the base below it, gives exactly 80 ft. to the top of the cornice, which is the ordinary way of expressing the height of a building.

My theory is that Pliny says the height of the base and pyramid were equal; I almost think I may say, "quod erat demonstrandum."

Assuming for the present that the upper stage of the roof rose from the lower flat part in the form of a meta, as Pliny says it did, it must have been rectangular in plan like an obelisk, which was a frequent form of a meta in a Roman circus; it did not terminate in a point, for it supported the platform of the quadriga.

The size of the platform may be approximately determined by the space required by the chariot and horses. The portions of two of the horses of the chariot in the Museum give their length as about 9 ft. 6 in.; their width at the haunches is 3 ft. 6 in. The width of the four would therefore be 13·4 ft. Allowing 2 ft. 8 in. for the pole, and the three spaces between the horses, we get a platform 16 ft. wide. To get the length of the platform we add to the length of the horses, which is about 9 ft. 6 in., the space required for the chariot. As Greek friezes show the chariot close to the horses, and as the back of the wheel may have projected over the platform, a space of 7 ft. 6 in. is sufficient for the chariot, making the length of the platform 17 ft.

Taking the platform at these dimensions, namely, 17 ft. long by 16 wide, we have next to find what was the slope or angle of the sides of the meta, whose steps, with the flatter steps of the lower part of the roof, must make up Pliny's twenty-four steps of the pyramid contracting itself into a meta.

There is one step among the remains

found with the quadriga group 1 ft. 11½ in. high and 4 in. tread. May this step have been one of the steps of the meta? Let us try as a working hypothesis whether it fits. If we take it as determining the slope of the meta on the sides, we find that this slope produced downward from the platform to the ninth step of the pyramid comes directly over the entablature of the inner range of columns, and that the meta at the sides of the building is supported by them. Among the remains the four corner steps which, from the draft lines on them, giving the width of their tread, prove that the steps of the adjacent sides of the pyramid differed in width, on one side being 1 ft. 9 in. wide, on the other 1 ft. 5 in.; and there are other steps which fit these dimensions, all having the same rise of 11¾ in., thus making the slope of the pyramid at the front less steep than at the sides. The slopes of the meta at the fronts must have met the pyramid at the same level of the ninth step, and to meet the chariot platform would rise at an angle of 75 deg. There are not among the remains any steps of the height of those I have assumed may have formed the sides of the meta at the fronts which would accord with this angle, but it is not a violent assumption, if the other parts fit, to suppose that they have been lost.

The front steps of the meta at this slope fall within the inner range of columns, but not too far within them to be securely supported by them, as I shall show later.

There are two other steps among the remains for which we must find a place in the restoration, one of 10 in., the other 4 in. on their treads, both 11¾ in. high, the same height as the flatter pyramid steps. If we place them between the highest of the broad steps of the pyramid and the tall steps of the meta it lessens the harshness of the junction between them and increases the size of the meta, making the platform large enough to accommodate the chariot group.

In this respect also the remains fit in with the hypothesis.

Having got the heights of the different stages of the building from the dimensions of Pliny and Hyginus and the remains, and having shown how they all agree, we have now to determine the relative lengths of the sides and fronts of the monument. I think I have proved that we are under no necessity, as Pullan and his successors have supposed, to make the roof larger than will cover a building of Pliny's dimensions of 63 ft. on the sides and shorter on the fronts, the size he gives for the Pteron with its thirty-six columns. I have taken Cockerell's arrangement of these in two rows of twenty-two in the outer range and fourteen in the inner as a working hypothesis (see plan fig. 3). I had arrived at it before I saw Cockerell's plan. Wren adopted it, and it is the obvious arrangement, which no one thought of doubting till the discovery of the flat steps of the roof seemed to demand a larger building; and it accords with the remains.

As I have already stated, one lacunar among them — the ceiling of the space between four columns—proves the intercolumniation—the distance from centre to centre of the columns—to be 9 ft. 9¼ in.

We found that the length of the sides of the building was 63 of Pliny's feet. If this is correct, if there were six intercolumniations on the sides, there must have been, in order to find positions for the thirty-six columns, five on each front. Pliny's assertion that the building was shorter on the fronts exactly describes this arrangement. It gives an opening, not a column, in the centre of each front, as in Greek temples, which I think justifies Pliny in calling these shorter sides the fronts, though they had no pediments over the colonnade such as marked the ronts of Greek temples. The Mausoleum roof, being a pyramid, not having a long ridge like a temple roof, would have sloping roofs at the ends as well as at the sides, not gables or pediments, else it would not be a pyramid, and there seems no necessity for Mr. Oldfield's assumption that the fronts had pediments to mark them as fronts.

The respective lengths I have supposed for the sides and fronts are confirmed by other remains in the Museum. Taking as a working hypothesis the broad steps of the pyramidal roof for the fronts and the steep steps for the sides, they meet at the ninth step (the level at which I suppose the pyramid to change to a meta) at a level platform. If the pyramidal roof is carried down at these two slopes to the first step above the cornice, it exactly fits a building of Pliny's six intercolumniations and his dimension of 63 ft. for the sides, and five intercolumniations of the same size for the fronts, or 52 ft. 7 in.; and the meta rising from this platform to the required height gives us a base for the quadriga of the size we found was required for the remains of it in the Museum. This, I think, adds another piece of evidence, which from its nature is cumulative, for the restoration I suggest.

I had drawn the fronts with a slightly wider intercolumniation in the centre, but this proves that they were the same all round the building, and that the length of the shorter fronts, viz., the width of the building, was 52 ft. 7 in., and that the flatter steps were towards the fronts, the steeper on the sides.*

## NOTES.

Architectural Competitions in Russia.

THE Imperial Society of Architects of St. Petersburg has issued a set of regulations for the conduct of architectural competitions. In many respects these are identical in spirit with those of the Institute of British Architects, but differ in some important particulars. The regulations provide, not for an assessor, but (after the more usual continental fashion) for a "jury" composed of architects, with the intimation that in special cases where such assistance seems to be required, one-third of the jury may be composed of specialists in art or science, selected for the occasion. The most important points to be noted are that it is specially stated that only sketches ought to be required from competitors, together with general estimates based on cubing—the instructions to direct the manner in which the cubing computation is to be made; that where only one response is made to the invitation to compete, the first premium ought to be awarded to that one (a very doubtful recommendation); and that it is an absolute condition that the designs should all be publicly exhibited both *before* and after the award of the premiums. This latter condition is what we have over and over again urged. The system in England, of exhibiting competition designs (if at all) only after the award has been made, serves to show when injustice has been done, but does not prevent it, and therefore robs the exhibition of almost all its real value.

* To be concluded in our next.

Autumn Exhibition at Liverpool.

THE twenty-sixth exhibition was opened to the public at Liverpool on the 31st ult., in the Walker Art Galleries. The collection comprises upwards of twelve hundred works of art in oil and water-colour, sculpture and architecture. Many of the principal pictures have been secured from this year's Royal Academy exhibition, but the most interesting and certainly the most intellectual may be found in about half a dozen fine works, some of which have been lent from private collections, and by themselves are quite worthy of a journey to see and study. Amongst them we can name "Her First Dance," by Mr. W. Q. Orchardson, R.A., lent by Mr. Henry Tate; "The Infancy of Jupiter," and "Time, Death, and Judgment," by Mr. G. F. Watts, R.A.; and between Mr. Watts's pictures hangs the long and large "Sponsa de Libano," by Sir Edward Burne-Jones. Mr. Holman Hunt's picture, "The Hireling Shepherd," with its minute and scrupulous rendering of everything within its frame, displays an intense example of early pre-Raphaelitism. And a contrast between it and "The Empty Cage," one of the last works of a former member of the celebrated brotherhood, will afford much interest in showing the marked changes in style which followed the subsequent career of the late Sir J. E. Millais. On the walls of the rooms are placed some excellent portraits, many by local artists of repute. The local men shine also in the water-colour room, where their colouring is very good. Attention and encouragement has been given to the exhibition of sculpture; but we cannot say the same as regards architecture. The exhibition of works in this branch of art may be described as altogether deficient, unless the few inferior drawings relegated to the entrance staircase may be made an excuse for it. This is the first exhibition that has missed the familiar form of the late Mr. Philip Rathbone, who for many years was not only the Chairman of the Exhibition Committee, but its moving spirit.

The Architectural Association Curriculum.

THE Curriculum of the Architectural Association for the Session 1896-97 is now published, and the facilities therein offered to architectural students embrace a most complete course of education. We are especially pleased to note that the recently organised School of Design and Handicraft is now established on a firm basis. The committee of Visitors comprises a list of twenty of the most accomplished designers of the day, and the young architectural student who has the opportunity of working under the guidance of such instructors has a privilege that can be obtained nowhere else in the world. Nor is the work confined to mere paper design, for arrangements have been made for practical experience in the technical workshops of the Trades Training School in Great Titchfield-street, the Battersea Polytechnic, and the Chelsea Polytechnic. For those who aspire to membership of the Royal Institute, the subjects of the Intermediate Examination appear to be covered by the lectures and classes of Divi-

sion I., whilst Division II. embraces the subjects in the programme of the Final Examination. Instruction is also provided in the diverse and extraneous subjects of quantity surveying, modelling, water-colour painting, colour decoration, and sketching and measuring. The very successful Discussion Section is to be continued, and we are glad to see that various problems of the art side of architecture are to be ventilated as well as the more scientific questions to which it has been the tendency in the past to confine the topics of discussion. The committee is to be congratulated on the very admirable programme set forth, providing, as it does, for the needs and the idiosyncracies of every class of architectural student.

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Art Notes from Paris.

A CONSIDERABLE number of sculptures have now been arranged in the beautifully-designed Galliéra Museum at Paris, with great improvement to its effect. The three large bays looking towards the garden have been thrown open, and the Fine Arts Department of the Paris Municipality has arranged some of its sculpture here, where it stands out with admirable effect from the background of ancient tapestry. Among the works to be seen here are the "Pandora" of M. Vingtrié, "Ô Jeunesse" by M. Pézieux, the "l'Amour" of M. Demaille, the "l'Avenir" of Maturin-Moreau, &c., besides the bust of Victor Hugo by M. Rodin, that of Houdon by Turcan, and a bust of a woman by M. Desbois. Under the colonnades surrounding the entrance are other works of sculpture, by MM. Peyrol, Houdain, Cordonnier, and other eminent sculptors; and other works of equal interest have been placed in the porticos towards the garden. This is only the beginning of what promises to be an art collection of constantly-increasing interest, enshrined in a building architecturally worthy of its purpose. At the same time the Paris municipality has been occupied in preparing the Hôtel de Ville for the visit of the Czar by completing some more of its artistic decorations; M. Henri Martin's fine painted frieze representing Painting, Sculpture, and Architecture, has been fixed in its place, also the frieze by M. Bonis under the title "Les Exercices Intellectuels;" and M. Adolphe Binet's last composition, representing the inhabitants of the suburbs of Paris taking refuge within the city, has been placed in the apartment dedicated to reminiscences of the siege of Paris. In the same room has been placed a fine gilt bronze reproduction of the Tomb of the Medici, which decorated one of the rooms in the old Hôtel de Ville, and was one of the few things saved from the conflagration of 1871.

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Technical Education, Brickwork, and Masonry.

THE new programme of technological examinations of the City and Guilds of London Institute includes many changes. The subjects of "Brickwork and Masonry" are henceforth to be considered apart, a special examination being held in "Brickwork," and another in "Masonry," whilst a practical examination is added in each case, the test being made in London. This is decidedly a step in the right direction; a man who is to do practical brickwork very rarely takes up masonry, and *vice versâ*. He wants to know as much about brickwork as possible, and that only, leaving mason's work to the masons. And we trust that the curriculum may be the means of providing us with better men in each department—something that will lead the workman to take more interest in his work, with a view to creating his own advancement by his own energy, and without the aid of the agitator. We believe that this new departure on the part of the City and Guilds of London Institute will be thoroughly taken up and will do much to fill the void left through the lapse of the apprenticeship system.

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Streets and Buildings at Liverpool.

A PROPOSAL of the Health Committee of the Corporation of Liverpool was brought before that body on Wednesday, and is of considerable importance. It was to the effect that application be made to the Local Government Board for a provisional order to amend the Liverpool Local Act in several particulars. The first of these was that all new streets shall be at least 36 ft. wide, instead of 30 ft. as at present, and all new back passages at least 9 ft. wide. Provision is also to be made that back passages and streets shall open into streets of equal or greater width, so that they may be properly scavenged. Lastly, it is proposed that no building shall be erected to a height beyond a limiting angle of 45 degrees from the opposite side of the street without the consent of the Corporation. These are changes in the right direction. Open spaces cannot be allotted all over a town, and consequently the health and comfort of the inhabitants must be safeguarded by wide streets and buildings of a reasonable height. In this country, where the sunshine is often absent, high buildings largely increase the gloom, and consequently the unhealthiness, of our towns.

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New Monuments at Père Lachaise.

BESIDES the great work by M. Bartholomé, the "Monument aux Morts," the cemetery of Père Lachaise is also to receive shortly another important work, the monument to be erected by the Paris Municipality to the memory of artisans who have been killed by accidents in the course of their work. This monument is to be carried out from the general designs of M. Dupré, the architect, but it will also include important sculptural work.

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The New Observatory on Ben Nevis.

THE new half-way observatory on Ben Nevis, about which some paragraphs have appeared in the daily papers, is a very humble-looking affair in outward appearance; as far as structural work goes, it is in fact merely a lengthening of the small wooden house which was erected a few years ago at the foot of the steep upper portion of the ascent, to serve as a ticket-house and a shelter when required, and which is now enlarged sufficiently to provide for a resident observer at this point. It is hardly in working order yet; in fact, little had been done when we visited it last week beyond setting up the thermometers and barometers in a Stevenson's screen behind the house. But the half-way observatory is a very important link in the Ben-Nevis observations. Many persons, we imagine, are not clearly aware that the special reason for founding a meteorological observatory on Ben Nevis was not merely that it was the highest available point in Great Britain, but that it afforded the opportunity of carrying on coincident observations from a high level station and from a sea-level station at a very small horizontal distance, viz.: that at Fort William, only about four horizontal miles from the summit of the mountain. Thus the state of the atmosphere at the two levels can be continuously observed and compared, with very important results in assisting our knowledge of the causes and phenomena of meteorological changes. The half-way observatory will afford the opportunity of recording the state of the atmosphere, at any given moment, between these two extreme points of observation, and of observing especially the flow of currents of air and up and down the side of the mountain under various conditions of temperature and pressure; thus it really forms the necessary complement to the observations at the base and the summit of the mountain.

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## THE ARCHITECTURAL ASSOCIATION SUMMER VISITS:

### LINDFIELD, SUSSEX.

A VERY pleasant day's outing was enjoyed by those members of the Architectural Association who on Saturday last carried out the programme arranged for them by Mr. H. Edmund Mathews. Reaching Hayward's Heath station about midday, the party walked to Lindfield village, and made their way first of all to the church, a picturesque building, principally of fourteenth-century date, the chief interest of which internally is in the new work, influenced by the well-known glass painter, Mr. C. E. Kempe and the architect, Mr. Somers Clarke. The baptistry is especially worthy of notice. After luncheon at the Bent Hotel, which itself has a very charming formal garden, the visitors walked across the meadows to East Mascalls, a house of small manorial size, built originally in 1578 by Nicholas Newton, whose father came from Cheshire, and hence probably the striking similarity of the half timber work to some of the peculiarities of Cheshire work. The house has been allowed to fall into grievous decay, but is now being made habitable under the direction of Mr. Walter Millard. Unfortunately, the exigencies of a modern residence and the sum at his disposal have obliged the architect to treat the old building with the respect that mediæval master masons usually accorded to the work of their forefathers than with the veneration that modern archæology demands. Thus one wing has been pulled down and the gable front turned round. The interior has been much modernised. One must be thankful, however, for small mercies, and it is a matter for congratulation that the whole has not been pulled down.

On the way back to Lindfield a halt was made at Pax Hill, where, by means of considerable additions, a fine mansion has been constructed on the basis of the old house built in 1610 by the Broads, of which little more than the hall now remains.

Arriving once more at Lindfield, the party visited the house which Mr. C. E. Kempe has built for himself, starting from the small manor house, "Old Place," built about 1590 by the Chalenors. Mr. Kempe has made very large additions to this, and by using old bricks and old stone slates, and copying literally details from Earl Mascall's and other houses, has succeeded in producing a charming result which has quite the character, at least externally, of old work. Internally, the house is rich in carved woodwork, stained glass, ornamented plastering, hangings, and fine furniture. The garden is a notable example of the "formal" treatment that is now the vogue. There is, however, somewhat of a stagey effect about the avenue, ending in an elaborate gateway leading to a grass field, and a sense of theatrical effort throughout rather detracts from the enjoyment of the whole environment of the house. A curious feature in the house is the chancel screen which Mr. Kempe had made for the church; but the gift being declined, he has built a room or chapel for its reception in his own residence. An old cottage is still preserved, and is an interesting example of a sixteenth century Sussex cottage. Formerly a neighbour of the squire's house it is now a lodge, to the new mansion.

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## Illustrations.

### CITY OF LIVERPOOL MUSEUM EXTENSION AND CENTRAL TECHNICAL SCHOOLS.

THE plans illustrated were devised to show that a fairly complete Central Technical School could be conveniently erected upon the site under the Museum Extension, without any sacrifice of efficient lighting. Deficiencies in the requirements laid down in the instructions were therefore made good, the levels of the floors chosen to provide for several useful mezzanines, and the following points considered as essential to a successful scheme :—

1. The areas of rooms laid down in the instructions regarded as a minimum.

2. 15-ft. pitch to the rooms.

3. A minimum proportion of one of glass to five of floor area in the lighting.

4. The continuation of the main string-course of the old Museum, even if itself used as the lintel of the first floor windows of the Technical School, brings the window heads much too low in the rooms. Without reducing the importance and value of this string-course, the design was specially considered to meet this difficulty.

5. The offices of the Museum staff should be conveniently placed upon the ground floor of the Museum without encroachment upon the space of the new galleries.

6. Working and class rooms arranged upon the same floors and in series in each department.

7. Adequate retiring rooms to permit the more public use (when required) of the lecture-hall, planned to seat over 500.

8. The laying out of so important and valuable a site to its utmost capacity.

The wording of the instructions, "The building line to be adopted in Byrom-street is left to the discretion of each competitor," was understood as giving reasonable liberty to the competitors in this direction, with a view to using the site to the best advantage in all particulars—a liberty quite within the power of a Corporation, having the control of building lines, to give.

The building line in Byrom-street was therefore chosen 13 ft. back from the ordinary building line of the street, which was taken as the line of the area balustrade. A 61-ft. street at the narrowest point, measured to the area balustrade, was thus secured. The design was, however, disqualified on this head.

In the matter of design, it was held that the existing architecture should rule the lines and proportions of the additions, but that slavish imitation of details should be avoided.

A small pavilion was introduced at the head of the staircase leading to the platform in William Brown-street. This served the purpose of a fresh-air inlet to supply the whole of the heating and ventilating apparatus, which was arranged upon the Blackman system.

An alternative was submitted, showing the lecture-hall with level floor and raised stage.

The tower, which serves as an exhaust ventilator, was chiefly introduced to mark this great group of buildings in a distant—and especially a river—view of the city. W. D. CARÖE.

### 24 & 25, KING WILLIAM-STREET, E.C.

THIS design was made for a corner site in King William-street, to contain five floors of offices, with basement, and housekeeper's rooms in the roof. The building has not yet been carried out, but it is intended that the materials should be red brick and stone, with a red tiled roof. GERALD C. HORSLEY.

## *ARCHITECTURAL SOCIETIES.*

GLASGOW ARCHITECTURAL ASSOCIATION.—A meeting of this Association was held at the rooms, 187, Pitt-street, on Tuesday evening. Mr. McGibbon, the Honorary President, gave a paper entitled "A Review of Recent Glasgow Architecture." The works done during the past decade had been influenced by their purpose and by the materials employed. Gothic to-day was dormant, if not dead, unless for church work. Buildings might be classified according to their purpose, such as ecclesiastical, domestic, civic, commercial, &c., or we might take materials, say of stone, plaster, metal, glass, tiles, &c. Referring to church work, the essayist pointed out that the only Classic building recently executed was that at Langside. Our schools were altogether of a substantial description ; well provided with all the essentials, handsomely paved, well lighted, &c. Insurance companies within the last few years had been, perhaps, the most generous patrons of public architecture. In the Equitable, the fact of its being an English office was fittingly expressed in an Englishman's design in English brickwork. Banks with us were the most sumptuous of our domestic buildings. The work of the Corporation was more varied than it used to be. In all their work there was a commendable absence of prettiness. The baths, in the essayist's opinion, should be arranged more as places of public resort. The tenements generally were of a commonplace description, but one or two instances were given of a really superior class of buildings. Our bridges and chimney-stacks were referred to, and the people of Glasgow were commended in allowing such interesting and worthy landmarks to remain as the Tron Church, St. Mary's Church, &c. This very interesting paper was ultimately brought to a close by a hearty vote of thanks to the essayist.

### GERMAN ARCHITECTS AND CIVIL ENGINEERS IN CONGRESS.

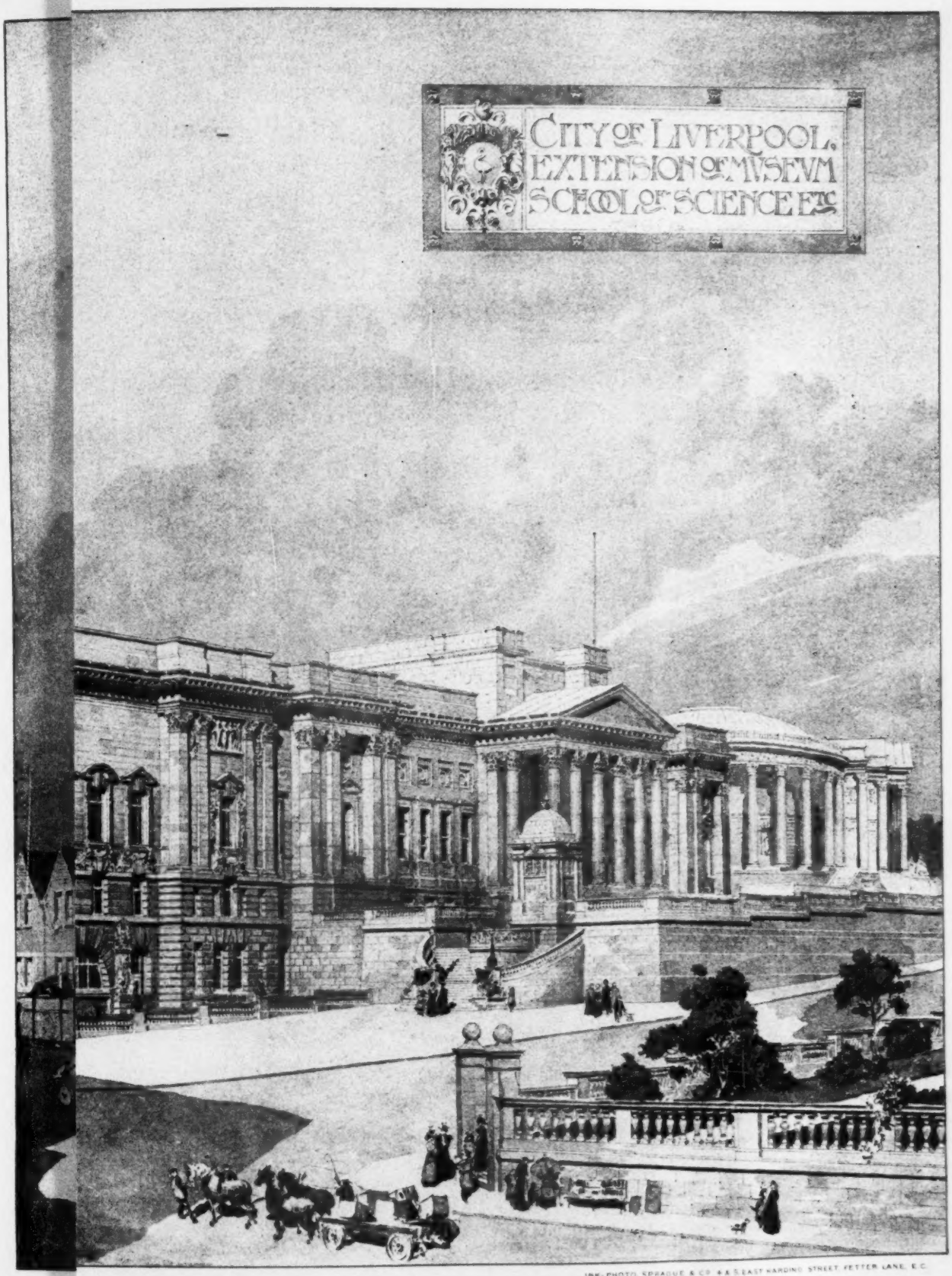
GERMANY is noted for methodical and thorough organisation in all branches of public business, and it is gratifying to be able to observe that the management of the great biennial gathering of the Amalgamated Societies of Architects and Civil Engineers, in this respect, left nothing to be desired. There were really two gatherings, a business meeting which was convened for the 28th and 29th of last month, and a general meeting which took place on the 30th, lasting for several days, and including supplementary excursions. This general meeting was open to members of any society attached to the union, and it should be added that thirty-three bodies, with a total membership of over 7,000, were represented. In the case of the business meeting, however, only the official representatives of the above-mentioned thirty-three societies were invited to attend, the number of delegates being proportionate to the strength of the associations they represented, in which respect the Berlin "Architekten-Verein," with a membership roll of 1,755, easily heads the list. According to the Statutes, every society numbering 200 members should be represented by one delegate, and another delegate is added for each additional 200 or part of 200. Berlin is, therefore, entitled to eight representatives, and, similarly, Bavaria, with 732 members, to four. A Council is chosen from the delegates, consisting of a President, a Secretary, a Vice-President, and two Advisers, while the Chairman of the Local Reception Committee of the locality in which the meeting takes place attends its deliberations by right of his office. The pleasure side of the meetings, including sight-seeing and excursions, is left entirely in the hands of the Local Committee. A combined gathering which consists of a business meeting and a general meeting only takes place biennially, and is generally held at some important centre, whilst the business meeting takes place annually, the intermediate conference of the delegates being generally relegated to some minor town.

The gathering has been exceptionally fortunate in having "Geheimer Baurath" Hinckeldeyn as its President, and Herr Pinkenburg as its Secretary, whilst Herr von der Hude acted as the local member of the Council. The Congress was not only well attended by the full number of delegates and many hundreds of ordinary members, but the ranks of both these classes included practically the leaders of the German profession, who are generally too prone to absent themselves from meetings of this kind. Both the architects and engineers in private practice, and the members of the two professions who are in Government or municipal employ, co-operated in the most friendly spirit, and this is much in a country like Germany, where there is too often a tendency to disagreement between the official and private sections of the different professions. We should, perhaps, also note that the Congress has the patronage both of the Government and the Berlin municipality, and that whilst the former put the principal council-chamber of the Houses of Parliament at the disposal of the visitors, the latter most liberally entertained the members of the allied societies at the Town-hall. The exhibitions, the public and private institutions, all opened their doors to the members of the Congress, and Berlin as a whole appeared pleased to see the numerous representatives from all parts of the country attend within the walls of the capital city.

The business meeting fully redeemed the promise of its name ; a great quantity of useful information was exchanged, and varied views expressed in a most practical and concise manner. Thanks to the secretary the agenda was most carefully prepared ; in a manner, in fact, which it has seldom been our lot to see ; and there was a full supplement of detailed reports and opinions, printed in a clear and readable manner. It would perhaps be well to explain that all questions under discussion are first put before the various societies concerned for them to discuss and pronounce opinions thereon, and a *résumé* of these is then published by one of the societies to which is entrusted the special charge of managing any one problem. The Council then generally proposes what action shall be taken in the form of a resolution, and the delegates discuss this resolution with the notes of the various societies before them, and are very careful not to arrive at any decision unless all the preliminary work can be considered thoroughly exhaustive. There is, indeed, a slight tendency to be biassed as regards the preliminary work not being sufficiently thorough, and it often happens that the matter is referred back to the society which had charge of the preliminary preparations. There exists also, we are afraid, a tendency on the part of the Executive Council to avoid going before the delegates with energetic resolutions in favour of any measure, and rather to point out the possibilities of the case, and leave the decision in the hands of the delegates themselves, without expressing previously their opinion. Of course, a policy of this kind varies with the tendencies of the individual members of the Council, who are changed from time to time by election, and we are inclined to think that progress is, to a great extent, dependent on individual predominance of members in this executive body. As there will be a change in the Presidency after this gathering in favour of Herr Stübben, of Cologne, who has been elected to the chair, we trust, for the sake of this deserving combination of allied societies, that a more energetic policy may now find favour in the Council. Herr Pinkenburg's offices are retained as Secretary, and the business centre of the amalgamated societies will remain at Berlin, though the locality of this central authority is liable to change from time to time. It has been decided that next year's delegates' meeting will be held at the picturesque Bavarian town of Rothenburg, whilst the next biennial gathering, which takes place in 1898, is arranged for at Freiburg, in the Grand Duchy of Baden.

The most important discussion, as far as the Society is concerned, was as to whether the amalgamated bodies should have a journal of their own to represent the views of their members, and further the interests of the societies. Of course a journal of this description would mean a large outlay, and though a number of members had guaranteed to subscribe a considerable sum if necessary, it was considered inexpedient, for the moment, to venture on such a large expense. A further proposal was to take over from the Hanoverian and Saxon Architectural Societies their monthly and weekly journals, and negotiations had been commenced between the Council and the two bodies concerned, the latter, however, apparently wishing to retain the control of their organs, which seemed to be contrary to the general desire of the delegates. Another proposal had been made and negotiations long since entered into to the effect that the Amalgamated Societies should purchase a share in the *Deutsche Bauzeitung*, with a view to influencing this paper in the interests of the combined societies. In regard to this point, we can only say that we should regret to see the *Deutsche Bauzeitung* give up any of its freedom, for though a small journal, as compared with those of other countries, it is a boon to the German profession by the very fact of its independence, and really furthers the interests of the societies very materially as it stands. To give a journal of this kind any official standing in a country where the technical press is already practically entirely in the hands of the Government would be a distinct loss to the profession. We hold that the Amalgamated Societies would be well advised to start their own journal, even at some pecuniary risk, for if it is to fulfil the purposes for which it is intended, the "Verband" must be sole proprietor and have the entire management. We trust that the sub-committee which is to consider the matter will take a similar view.

A highly-interesting discussion took place on the principles and conditions of open competi-




INK-PHOTO. SPRAGUE & CO. 4 & 5 EAST HARDING STREET, FETTER LANE, E.C.

SCIENCE, LIVERPOOL

B A

COMPETITION FOR MUSEUM EXTENSION A

DESIGN SUBMITTED BY MR W

INK-PHOTO SPRAGUE & CO 44 & 5 EAST HARDING STREET FETTER LANE E.C.

XTENSION AND SCHOOL OF SCIENCE, LIVERPOOL

TED BY MR W D CARÖE, F R I B A

CITY OF LIVERPOOL
EXTENSION OF MV-
SEVM, SCHOOL OF
SCIENCE ETC.

— DETAIL OF ENTRANCE

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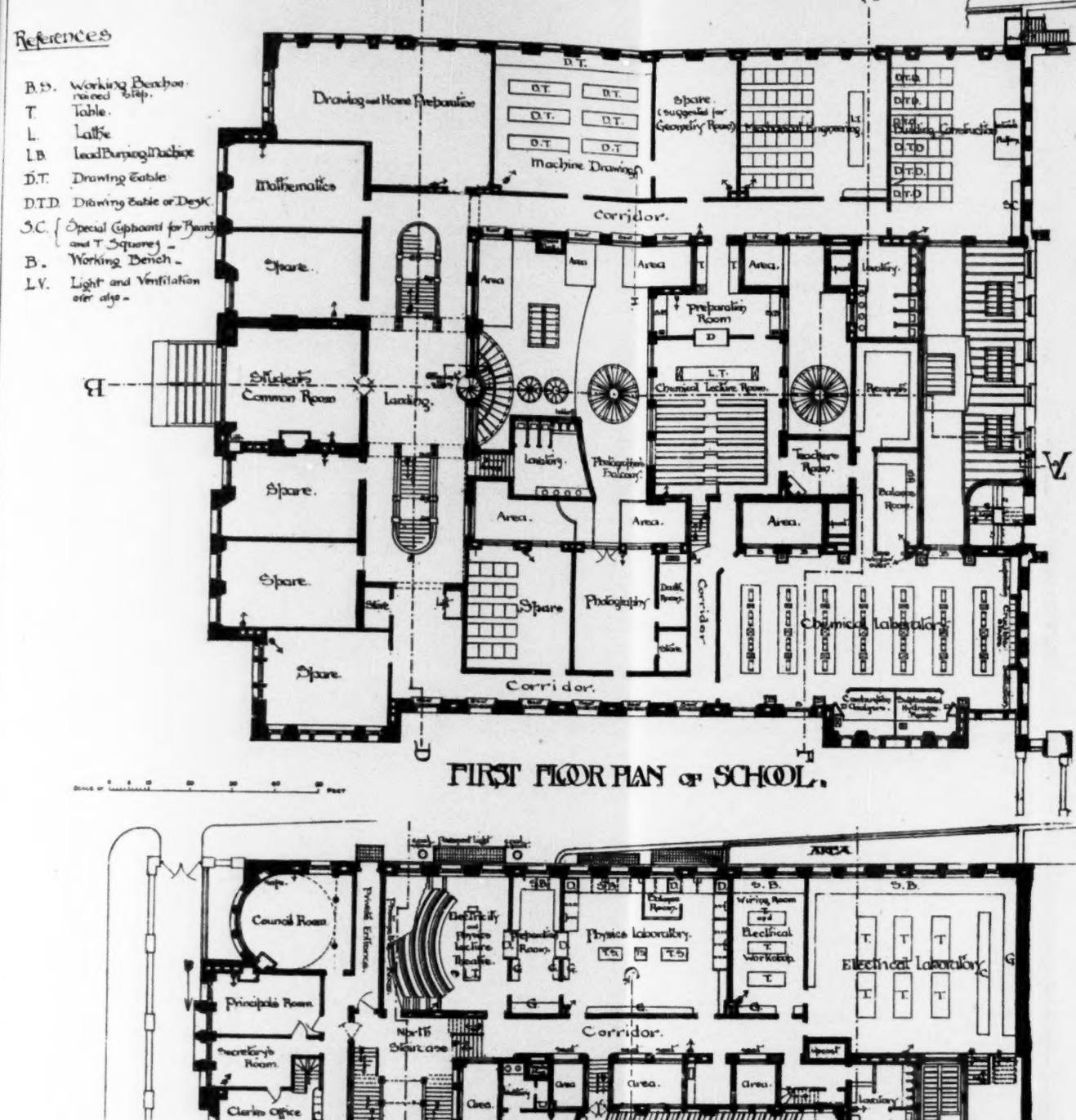
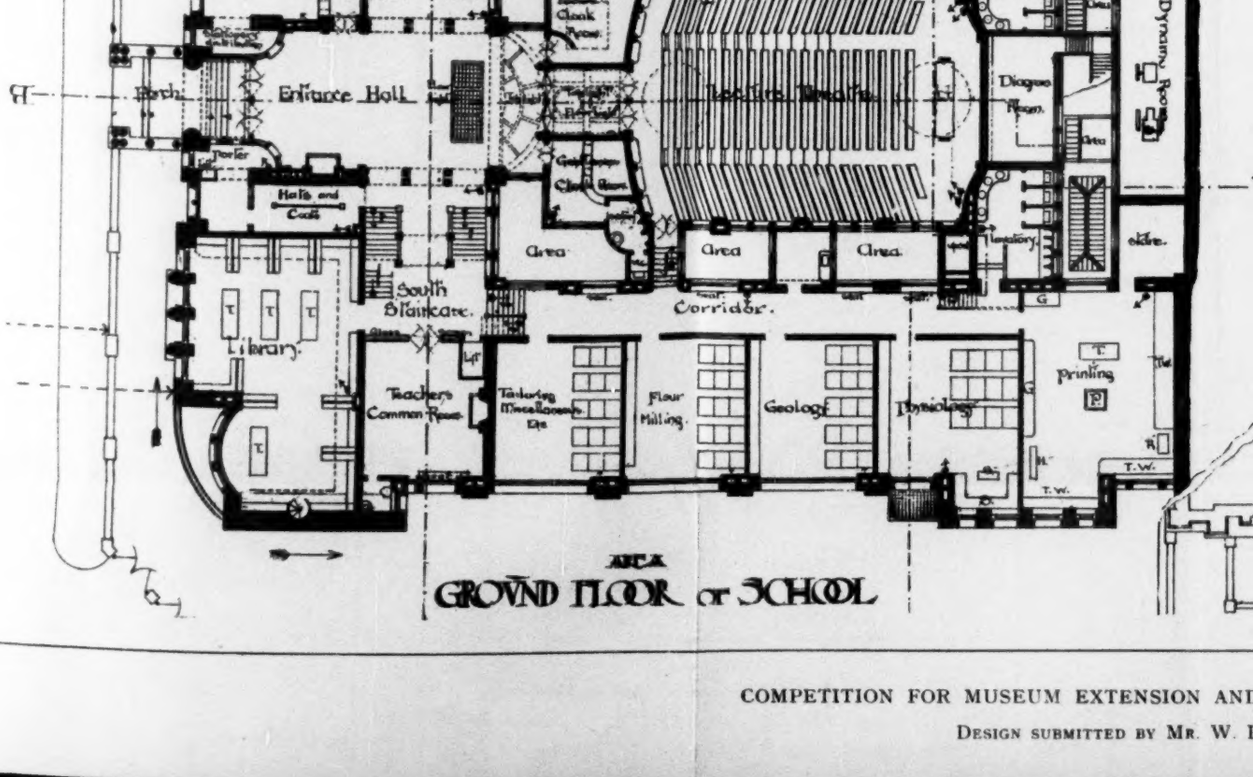
COMPETITION FOR MUSEUM EXTENSION AND SCHOOL OF SCIENCE, LIVERPOOL

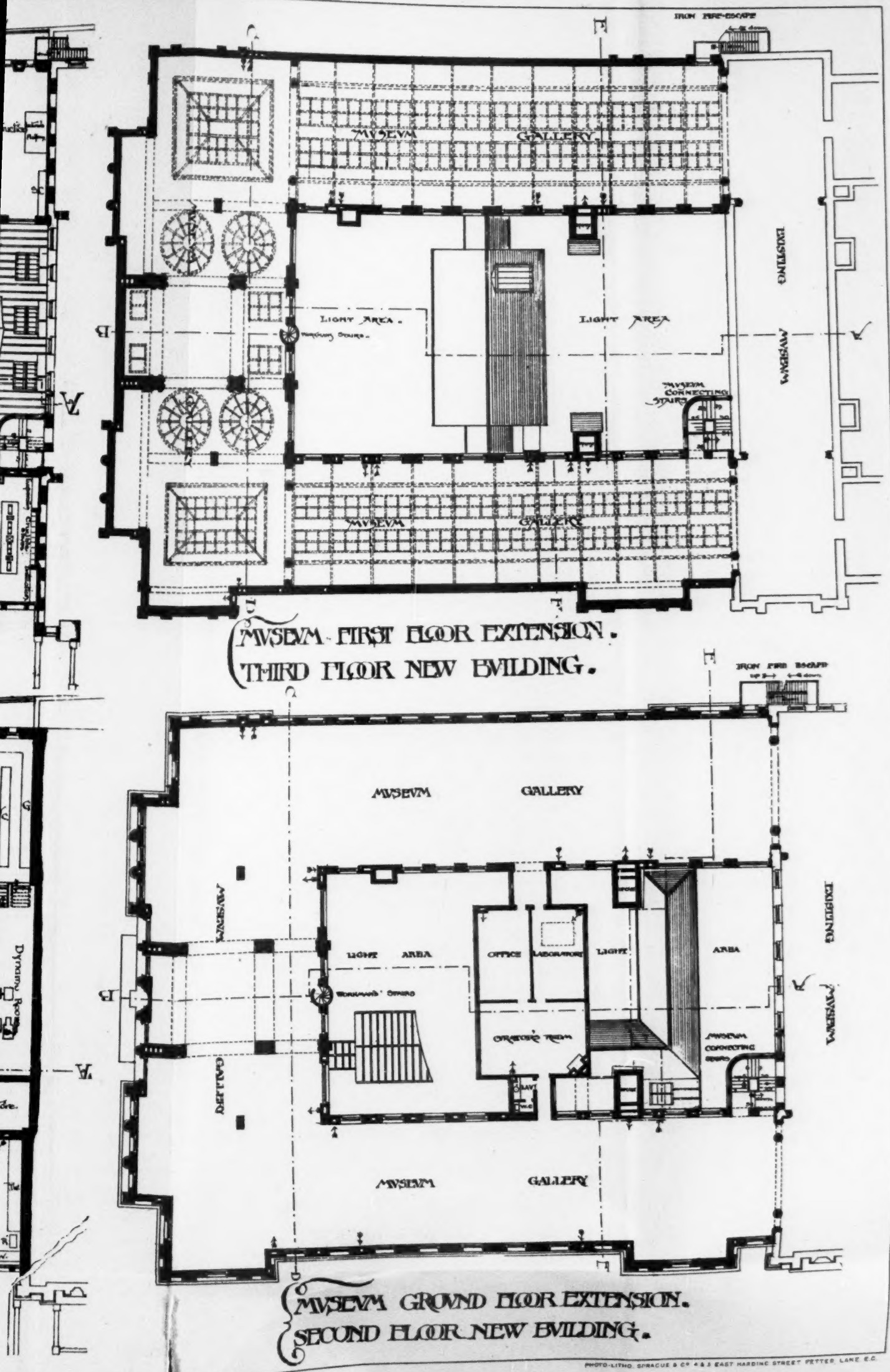
DESIGN SUBMITTED BY MR. W. D. CARÖE, F.R.I.B.A.




FIRST FLOOR PLAN OF SCHOOL.




GROUND FLOOR OF SCHOOL




MVSEVM FIRST FLOOR EXTENSION.
THIRD FLOOR NEW BVILDING.

MVSEVM GROVND FLOOR EXTENSION.
SECOND FLOOR NEW BVILDING.

PHOTO-LITHO. SPRAGUE & Co. 4 & 5 EAST HARDING STREET FETTER LANE E.C.

SION AND SCHOOL OF SCIENCE, LIVERPOOL.
Y MR. W. D. CARÖE, F.R.I.B.A.

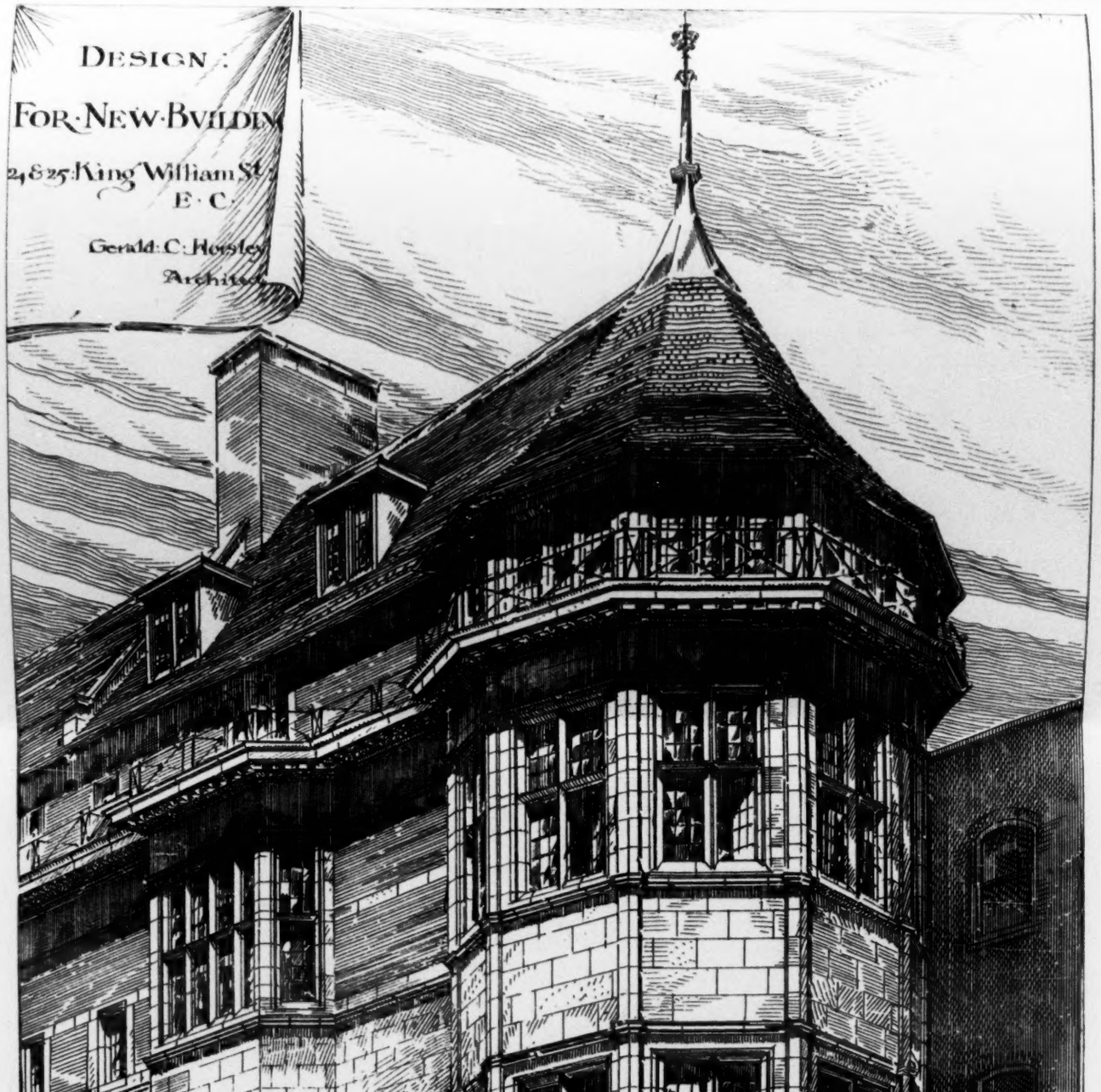
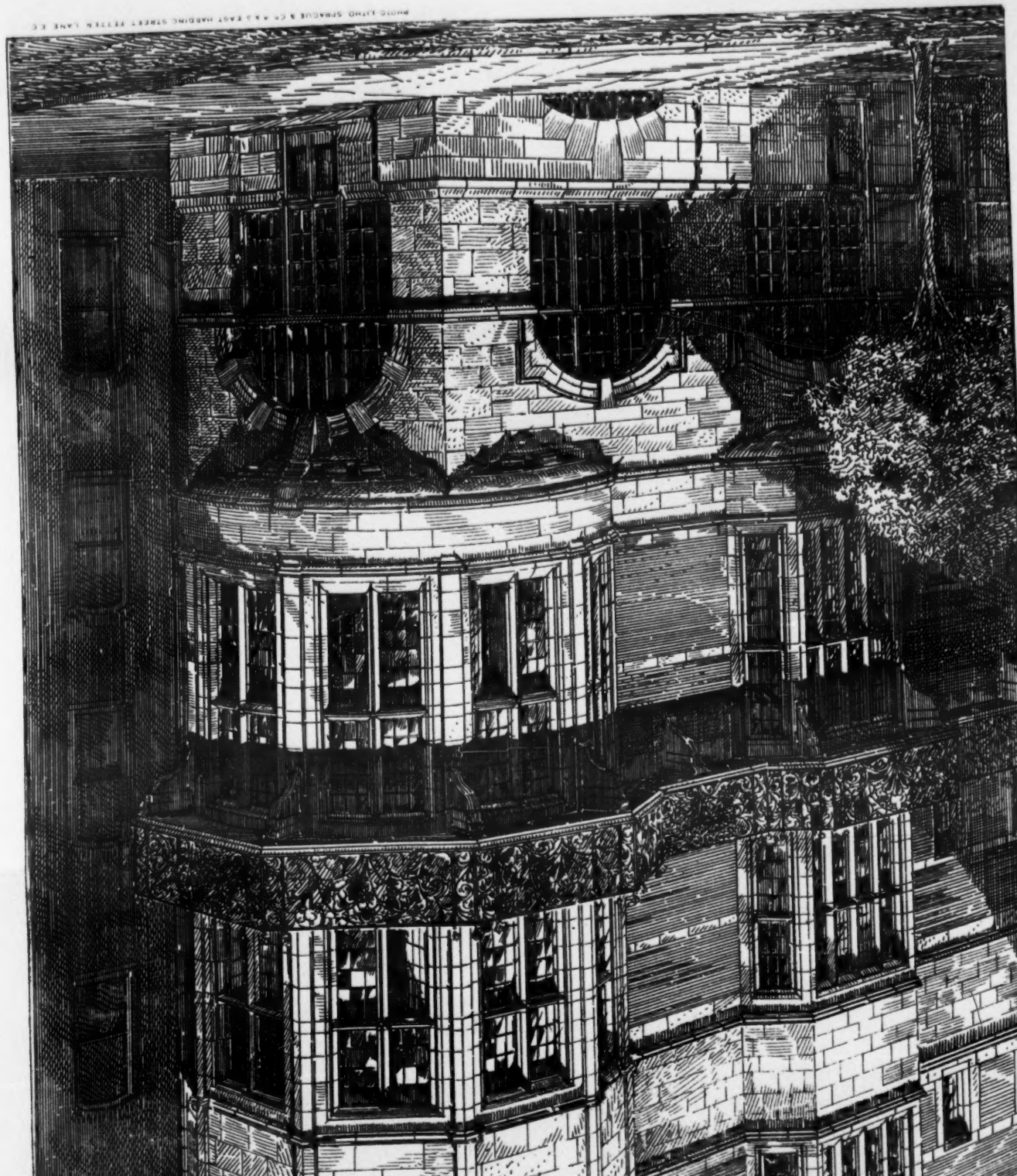

DESIGN
FOR NEW BUILDIN
24 & 25 King William St
E C
Gerald C Horsley
Architect

PHOTO LITHO SIMMONS & CO 443 EAST HARDING STREET PETTUS LANE E.C.



tions for architects and civil engineers. A model set of regulations had been circulated among the various societies, who had sent in some very excellent criticisms. The subject was fully discussed, and finally referred to one of the societies for revision. One of the main principles is that all work should be assessed by a mixed jury representing the interests of the profession and those of the employer, in which the number of the former should predominate. Every condition of the competition should be framed mutually by the employer and two professional men, and all members of the Allied Societies should undertake neither to participate as competitors nor assessors unless the model conditions have been applied by the employer. Competitions are to be divided into (1) Open, (2) Local, and (3) Limited, and further subdivided into (*a*) ideas, (*b*) designs. The amount of work to be required from competitors in each case has been especially defined as regards the number of drawings, scales, &c. The value of the premiums for each class of competition is under discussion, and there are special requirements with respect to the public exhibition of the work, &c. It appears to us, however, that the interests of the civil engineer were not sufficiently observed, and that two sets of model requirements should be drawn up separately, one for architects and the other for civil engineers.

A subject which we awaited with some curiosity had the title, "The Protection of Architectural Work against the Piracy of the Press." As a matter of fact the requirements under discussion were by no means so extreme as the title led one to expect. They practically took the form of a desire to petition the Government to grant the same protection to architectural work as is accorded to that of painters and sculptors. There was also a generally expressed desire to have the name of the architect or engineer published wherever a building is described or illustrated, a matter in which our own daily and general illustrated press is quite as much at fault as their continental contemporaries. There was also a wish to see substantial fees paid for the loan of illustrations or for contributions to the text of all journals. The whole matter was referred to the Dresden Society for consideration, and we are interested to hear what the result of a year's consideration will be.

A long discussion took place on the formation of some better regulations for the training and examination of students, which are too theoretical at present throughout Germany, and necessitate far too long a course. The debate on this subject was brilliant, and we only regretted that the ideas of the students were not represented. It is all very well for the senior members of the profession to decree the requirements, but we think the wishes of the students should also be fully considered. The proposed reform of training for architects and civil engineers will probably spread over many years, but the initiative taken at the gathering was exceedingly valuable.

Perhaps the most important subject of discussion was to be found in the proposal to reform the official scale of fees and disbursements throughout the country. The whole of the societies have practically had the matter under consideration, and the "Vereinigung Berliner Architekten" had framed the various proposals. This reform should be of special interest in this country, where there have also been many complaints respecting the present schedule of the Royal Institute. According to the present proposals, the work of the architect will be divided into seven classes:—(1) Preliminary Sketches, (2) Design, (3) Building Permission, (4) Estimates, (5) Contract Drawings, (6) Details, (7) Supervision. The percentage is to vary according to the original estimate or according to the actual expenditure, or rather, to be precise, according to the estimate for sections 1—4 inclusive, and according to the actual expenditure in sections 5—7 inclusive; the ratio of the cost of the interior decoration to the cost of the carcass, however, also being considered in the calculation. Though the calculation of fees according to this proposal will be somewhat complicated, it is shown that by having printed forms of charges the amounts can very easily be made up, and certainly a far fairer result arrived at both for the employer and the architect or engineer. We observe that the preliminary sketches are allotted a value more in accordance with the amount of brain work they occasion, and which is so frequently passed by unrecognised. The commission for sections 1—4 varies from 3½ per cent. on an estimate of 250*l.*, to 1½ per cent. on an estimate of 50,000*l.*, whilst in sections 5—7 it varies, on an actual expenditure of 250*l.*, from 3½ per cent. to 8 per cent., according to the ratio of expenditure on interior decoration being for $\frac{1}{10}$ or $\frac{2}{10}$ of the total outlay, or on an expenditure of 50,000*l.*, from 1 per cent. to 6 per cent., according to the ratio being $\frac{1}{10}$ or $\frac{8}{10}$ respectively. Great care is taken to prevent the architect's work being pirated in the form of duplicate houses from the same set of plans, and to give the copyright of the plans to the architect and not to the employer. We hope, on a future occasion, to be able to give a full translation of the reformed scale of charges, which may be of interest to architects in this country.

There was an animated discussion as regards the registration of architects and the titles by which an architect holding a diploma should be known, but no definite results were arrived at. Another subject of essentially local importance was the question of precedence for the Government and municipal building officials.

Of essentially technical subjects we would note a discussion of the methods of valuation for street improvements. Further, the publication of an officially recognised table of sections of girders, with details as regards their strength, was brought forward. We would also note a subject of some considerable archæological interest which was considered, *i.e.*, the publication of the history of German farm-houses, when some highly interesting illustrations were shown.

We cannot refrain from again calling attention to the business-like manner in which the meeting was conducted and the brilliant debating power displayed. The business meeting, which lasted a total of twelve hours, was so arranged that various minor sub-committees could sit between the meetings of the first day, and the forenoon and afternoon meetings on the second day.

The general meeting, which was convened for Monday, although a most successful gathering, does not call for the same amount of comment as the business meeting proper. The proceedings practically commenced on the preceding Sunday evening, with a reception of the visitors in the Town Hall.

The proceedings in the large council-chamber of the Houses of Parliament consisted of the usual annual reports and addresses, varied by interesting lectures on Electric Railways, the Extension of the Metropolitan Railway at Berlin, the Reconstruction of the Cathedral at Bremen, and the Restoration of the historic Marienberg.

A large number of prominent buildings, including the memorial churches to the Emperors William and Frederic, and several practical pieces of construction, were visited. The lighter side of the proceedings included a banquet at the Industral Exhibition, a successful excursion to Potsdam, and a conversazione at the International Art Exhibition. The principal value of the general meeting, however, was the opportunity it gave for the interchange of experience and views between prominent members of the profession from all parts of the country.

## THE SANITARY CONGRESS AT NEWCASTLE.

ON Wednesday the fifteenth Congress of the Sanitary Institute was opened at Newcastle, the event being made the occasion of a loyal demonstration in favour of H.R.H. the Duke of Cambridge, the President of the Sanitary Institute. At a reception of the members of the Institute, an address of welcome was presented to the Duke of Cambridge by the Corporation, and the welcome was repeated subsequently by the Mayor in a public reception of the members at the Durham University College of Medicine, which was attended by the royal President, the President of the Congress, Earl Percy, and about 1,500 delegates from sanitary and municipal bodies in all parts of the kingdom.

The after proceedings included a public luncheon, the opening of an exhibition of sanitary appliances (a ceremony performed by the Duke of Cambridge in the afternoon) and an inaugural address delivered to the members in the evening by Earl Percy, President of the Congress.

A report of the subsequent proceedings will appear in our next issue.

BAPTIST CHAPEL, WESTMINSTER. — The memorial stone has just been laid in Romney-street, Westminster, of a Baptist Sunday-school and class-rooms. The new schools will consist of two stories. The ground floor will be divided into two class-rooms, and there will also be a pastor's and a deacons' vestry. The first floor will be devoted to one big school-room. In the basement will be accommodation for the apparatus required for cooking when tea meetings, &c., are held. The architect is Mr. V. C. Brown.

## DECORATION OF THE SCOTTISH NATIONAL PORTRAIT GALLERY BUILDINGS.

IN December, 1895, Mr. J. R. Findlay offered to present to the Board of Manufactures an additional sum of £10,000 for the above purpose on certain conditions. Mr. Findlay's object was to make the National Portrait Gallery Buildings, as far as he could, worthy of the purpose to which they are dedicated, the illustration of Scottish history and the men who made that history. The Board accepted Mr. Findlay's gift, and appointed a committee of their number to formulate a scheme. A report of the Architect of the Board, Dr. R. Anderson, having been submitted, the whole subject is now receiving the careful consideration of the Board. The following is what has been decided to be undertaken by the Board in the first instance on the recommendation of the committee:—1. That four of the statues originally suggested to be placed on the exterior of the buildings should be undertaken without delay by the Board at a cost of about 200*l.* each, and that these statues should consist of George Buchanan, Dunbar the poet, James Watt, and David Hume. 2. That all the carved stonework of the interior in the hall and ambulatory which still remained unfinished, should be gone on with as soon as possible, and selected students of the School of Applied Art should be invited to make designs for this work, and the successful students to receive money awards. 3. That the ambulatory railings should be treated with some gilding, and that the shields in the centre of each panel should bear the arms of the members of the Board at the time the building was erected. 4. That the dark rooms at the east end on the ground floor of the Museum should be painted with white paint to improve the lighting.

With regard to a proposal by Dr. Anderson, that the walls of the staircase should be adorned by the introduction of a number of commemorative panels such as may be seen in the Bargello at Florence and other places in Italy and Spain, the committee are inclined to think that this might be favourably considered by the Board. In connexion with a proposal by the architect, that colour should be introduced into the sculpture heraldry on the exterior of the buildings, the committee think before coming to a decision in this matter that an experiment might be made by means of coloured paper on one or more of the shields to try the effect. With regard to the adornment of the walls and ceilings with decorative painting, the committee approve of Dr. Anderson's suggestions—1. That certain artists named by him should be asked to submit sketch designs for historical subjects; (2) that the students of the School of Applied Art should be invited to submit designs for the decorative treatment of the staircase ceilings; (3) that the effect of gesso work should be tried on a small portion of the brickwork of the interior walls, but that no painting or similar decoration should be commenced until all the carved stonework in the hall and ambulatory is completed. As regards the stained glass in the windows, the committee are of opinion that the possible introduction of some stained glass in the windows of the hall and staircases should be delayed until the character of the decoration of the hall and ambulatory is fixed upon and completed.

It may be stated that the statue of Dunbar has been entrusted to Mr. Pittendrigh Macgillivray, A.R.S.A., and that of David Hume to Mr. C. M'Bride.—*The Scotsman.*

# Correspondence.

*To the Editor of* THE BUILDER.

## BELFAST MUNICIPAL BUILDINGS COMPETITION.

SIR,—I have read Mr. Chas. Barry's letter carefully, and it seems to me that the facts as related by him leave the Council of the Royal Institute of British Architects in rather an unenviable position. The Belfast Committee seek assistance from the Institute; the Institute give them "their careful attention." The Belfast Committee—while secretly preparing a slap in the face—ask for further assistance, and the Institute again give it. After the back-hander is delivered, the Council acknowledge it to be a nasty one; but, says Mr. Barry, "of course, they [the Council] can do no more!" This statement tends to show that neither the Council nor the Competitions Committee realise the effect of their action; they do not seem to see that by "doing no more" they are tacitly consenting to a reduction of recognised fees, and creating a precedent.

If this view of the case is strongly, but temperately, placed before the Belfast Committee, the conditions will doubtless be revised; but if, after such remonstrance, they should not revise them, stronger measures should be taken.

R. F. CHISHOLM.

# The Student's Column.

## RURAL DRAINAGE.—X.

STONEWARE pipes are manufactured with various modifications in order to secure particular ends. Doulton's "capped," lidded," or "opercular" pipes are shown in fig. 9, half-socket pipes fig. 10, plain pipes with chair joints fig. 11.

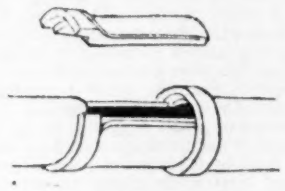


*Fig.* 9.

With regard to these and similar forms of pipes, Mr. Baldwin Latham says:—"Since the introduction of the mode of laying sewers in straight lines on plan, with manholes or lampholes at changes of inclination or direction, the necessity

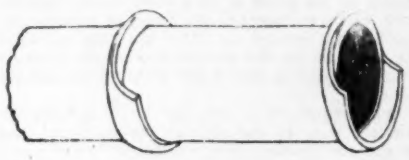


*Fig.* 10.

for the most part has ceased to exist which brought out all those forms of sewer pipes which were made with a special view to facilitate the inspection of the sewers, but which, however ingenious in themselves, multiply the parts, and

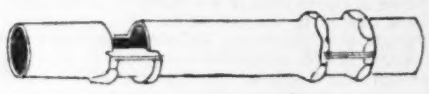


*Fig.* 11.

thereby complicate a work which should be of the simplest character."

In order to centre the spigot end of a pipe in the socket of the next (fig. 12), several contrivances have been suggested. Fig. 12 illustrates

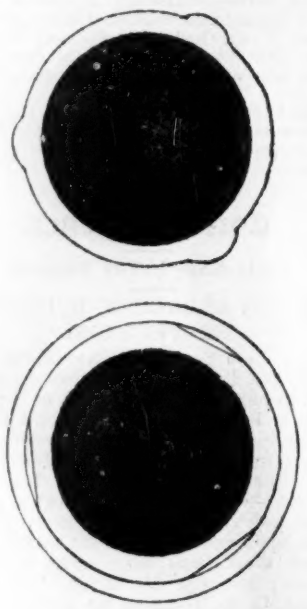


*Fig.* 12.

a form of joint introduced by Mr. Bothams, formerly City Surveyor of Salisbury. Projections are formed on the spigot and within the socket of each pipe, and by revolving the pipe so as to bring the corresponding projections into contact, concentricity is obtained. The "Paragon" pipes manufactured by the Albion Clay Company are so constructed as to give a true invert line without adjustment.

Egg-shaped sewers (fig. 13) are also manufactured in stoneware. It is found in practice, however, that small sewers up to 18 in. in diameter are best constructed of stoneware and circular in section.

The difficulties caused by irregularity in form of egg-shaped pipes produced by distortion in the process of manufacture more than counterbalance the advantages from the "hydraulic mean depth"

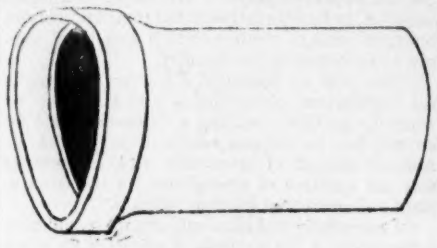


*Fig.* 13.

point of view. Above 18 in. in diameter sewers are best constructed of brick or concrete.

As a general rule, the backbone of rural sewerage consists of stoneware pipes, of the common socket pattern, and if these are selected with judgment, laid with skill, and jointed with care, the result is certain to prove satisfactory.

In laying socketed pipes, the spigot end must point in the direction of the current. This follows upon the rule that all lines of pipes should be laid from the lower end towards the upper—the process consisting in the insertion of the spigot end of one pipe into the socket end of the last pipe laid.

Sewers should be laid in straight lines with an even gradient from point to point, any change of direction or gradient taking place at a manhole or lamphole. By observing this rule a better velocity will be maintained in the sewage, obstructions will be easily located, and much time and expense saved in their removal. "When sewers are laid out in 'straight lines' and the surveyor insists upon absolute truth of workmanship both in line and in gradient, the work will necessarily be well done. With manholes and lampholes at each change of line, or of gradient, the surveyor, by removing the covers, can at any time set out the central line of sewer upon the surface, and can ascertain the depth from the surface to the sewer at any intermediate point, and so find the exact position of any side junction. Some surveyors cannot at first see (so as to appreciate) the full advantages of right line arrangements, and do not find it out until the works have been completed, and they wish to form junctions or to examine the sewers for cleansing and flushing, when they discover that the whole of the works, by reason of the manholes and right lines, are fully under inspection and command." ("Suggestions as to Drainage, &c.," by Robert Rawlinson, M.Inst.C.E., p. 7).

In order to secure true gradients "sight rails" must always be employed.

"'Sight-rails' should be put up in each street before the ground is opened out, showing the centre line of each sewer and the depth to the invert. The proper use of sight-rails in sewer and drain construction, when put up by the surveyor, will enable the foreman to set out and excavate the trench truly; these sight-rails should be strong and should also be securely fixed on firm ground; that is, beyond the influence of the excavation to be made; and if the substratum is peaty, or such as will shrink under pumping so as to lower the subsoil water, care must be taken that the sight-rail or bench-mark to be worked to is in such a position to remain unaffected, or the result will be a crippled sewer, that is the grade line will not be true." (Op. cit., p. 10).

Instead of fixed sight-rails pegs may be driven to the proper level and "boning-rods" held upon them.

The process of "setting out" levels is thus described in Rankine's "Civil Engineering," p. 113.

"In setting out levels of excavation the engineer causes stakes to be driven, whose heads are at the intended formation level. To plant a stake at a given level the staff is to be held upon the nearest bench-mark and read; the difference between the level of that bench-mark and that of the new stake to be driven is to be added to the reading of the staff if that stake is to be lower than the bench-mark, subtracted if it is to be higher. This gives the height which will be read upon the staff at the new stake, when that stake has been driven to the proper depth.

Two such stakes being driven at fifty feet apart or thereabouts, in the centre line, near the commencement of a proposed cutting, enable the excavators to carry on the cutting at the proper level and rate of inclination for some distance, by the operation called 'boning' which consists in ranging a line of uniform inclination from two given points in it, with T-shaped instruments called 'boning-rods.' Each of these consists of an upright staff, having a crossbar at right angles to it at the top; all the boning-rods belonging to one set ought to be exactly of the same height. To range or 'bone' the bottom of a cutting with them from two given stakes, two of the rods are to be held upright on the heads of the two stakes, and a third held upright at any point in the cutting which is in the same straight line with the stakes; when, if the bottom of the cutting is at the true formation level, the tops of the three rods will be in one straight line. In this manner the cutting is carried forward at a uniform rate of inclination, until the engineer thinks it advisable to plant a new pair of stakes by the level and staff near its inner end from which the boning goes on as before."

In drainage work the use of fixed sight-rails is to be preferred, as, although they are more likely to be moved accidentally in the course of the operations of excavation, at the same time, any alteration in their level would be immediately detected by the engineer or his representative in charge.

Each pipe when laid must rest throughout its entire length upon the solid ground, and for this purpose a "chase" must be cut in the floor of the trench to receive the socket. The material used for jointing is hydraulic cement. Clay joints should never be permitted.

"The materials most commonly used for jointing pipes is clay, which is one of the worst materials that could be found for the purpose. We seek the most impervious materials wherewith to construct our sewers, and often spoil their effect by the indifferent manner in which we put the materials together. A soft, yielding substance like clay is about the worst possible material that can be used for jointing pipes, as it must be clear that clay is liable to get washed out of the joints both from the action of water escaping from the pipe, or of water flowing from the subsoil into the pipe. Apart from this, a soft, yielding material, when used for jointing, notwithstanding how perfectly the work may be performed, will lead to failure, as the weight of earth covering the pipes causes the clay to be squeezed out of the lower part of the socket of the pipe, leaving an aperture in the upper part through which sewer air and sewage may escape, or water and sand be carried from the subsoil into the sewer. These serious defects in jointing not infrequently lead to the disturbance of the line of pipes, and destroy the regularity of their bed." ("Sanitary Engineering," p. 197.)

The best Portland cement is the proper material for jointing socketed pipes. This material is employed either neat, or mixed with an equal quantity of sand. The use of neat cement is sometimes objected to as being liable to fracture the pipe by expansion in setting. If, however, the cement is of good quality and uniformly ground, no mishap is likely to occur. In ordinary cases a much larger proportion of sand, say, 1 of cement to 3 of sand, may be employed with efficiency and, at the same time, considerable economy. In order to prevent the jointing material from working into the pipe, where it would form a ridge and cause an obstruction in the flow of the sewage, two or three strands of tarred gasket should be forced into the jointing space and driven home with a proper caulking tool. This method also has the advantage of rendering the inserted spigot end of the one pipe concentric with the socket end of the other. As a final operation, each joint must be carefully examined on the inner surface of the pipe, and any cement removed that may have passed through. No fresh pipe must be laid until this operation has been satisfactorily accomplished. The trench must never be filled in before the cement has set, or the joints will inevitably be injured.

Quick-setting cements, such as Medina, or Roman, and asphalte are sometimes used for jointing pipes with advantage under special circumstances.

In actual practice it was found that, with neat cement joints, the following quantities of cement were used:—

| Diam. of pipe. Inches. | Portland Cement. lbs. | No. of joints. |
|---|---|---|
| 12 | 52 | 20 |
| 15 | 55½ | 8 |

The following table will facilitate the calculation of railway rates and cartage :—

| Diam. of Pipe. Inches. | Length in Work. Feet. | No. of Pipes to the ton. |
|---|---|---|
| 3 | 2 | 180 |
| 4 | 2 | 100 |
| 6 | 2 | 80 |
| 9 | 2 ft. 6 in. | 40 |
| 12 | ,, | 20 |
| 15 | ,, | 15 |
| 18 | ,, | 10 |

An ordinary cart will carry about forty 9 in. pipes as a load.

## *GENERAL BUILDING NEWS.*

THE PROPOSED CATHEDRAL FOR BELFAST.—Four large drawings illustrating the design adopted by Messrs. Drew & Lynn for the proposed cathedral in Belfast are now on exhibition at the Free Public Library. One represents an exterior perspective elevation as seen from Donegall-street, the second the interior, the third a transverse section, and the fourth a ground plan showing the extent of the building when completed. We understand that an illustrated statement will very shortly be issued by the Bishop of Down and Connor and Dromore and the Vicar of Belfast showing how the building may be proceeded with in sections.—*Belfast News-Letter.*

CATHOLIC CHURCH, LEEDS.—The memorial-stone of a Catholic church and school was laid recently in Burley-road, Leeds. The new building is practically an extension of the church and school which were built on the site some four years ago at a cost of about 4,000*l.* It was originally intended that the building first erected should be entirely devoted to school work, and that a separate building, to be used as a church, should be erected. This plan, however, was abandoned, as it was deemed more advantageous to extend the existing church and school, and this work is at present being carried out from designs by Mr. J. Keily, architect, Leeds, at a cost of 2,500*l.*, the church being known as that of the Sacred Heart.

BATHS, HARROGATE.—The new baths at Harrogate are rapidly approaching completion. The building is placed in a hollow, and has a dome 100 ft. high, with two flanking towers, each 85 ft. high. Water is stored in the towers, and the necessary pressure for needle and other baths is thus obtained. The cost of the baths will be 82,000*l.* The architects (Messrs. Baggallay & Bristowe) commenced their work on April 11, 1894, and the foundation-stone was laid on July 1 following. The building consists of a central hall or pump-room for the use of water drinkers, a winter garden, suites of special and sulphur baths and dressing-rooms for ladies and gentlemen; a Turkish bath and rooms for the inhalation, &c., of the waters, dry massage, and other treatments. In connexion with the central hall are cooling, reading, and refreshment rooms, besides the manager's offices. The winter garden is 220 ft. long and 42 ft. wide, covered with a coloured glass roof and ornamented with a fountain and flower beds. The special baths consist of Harrogate massage, douche bath, Harrogate needle, vapour, Bertholets, ordinary needle; Bouillow rooms, well baths, Crane baths, and other special baths for use of the mineral waters. Then there are sulphur baths, and the necessary waiting-rooms, and other accommodation. These suites are on the north side of the building, and the Turkish baths and the other apartments, including the winter garden, are on the south. It is calculated that the baths and dressing-rooms will accommodate from 130 to 140 bathers at once, exclusive of water-drinkers and persons using the refreshment and recreation rooms. The basement contains accommodation for the attendants, laundry, bottling machinery, pumps, boilers, pipe subways, and so on. The style of architecture is Renaissance. The building is of stone, and the entrance is from Montpelier-road. One of the features of the Turkish bath department is the marble floor of the cooling room, which is of a Moorish pattern. The walls of the hot rooms are of variously tinted glazed brick-work, with horseshoe arches to the doorways in similar material and colour. The plunge bath in the Turkish department is 25 ft. long by 7 ft. broad, and is 4 ft. 6 in. deep. The dressing boxes are of pitch pine. They provide accommodation for about twenty bathers. The Crane & Wells baths, each capable of holding 300 gallons of water, are specially formed of concrete, and lined with Wedgwood tiles, and the steps and curves are formed of strongly-made white faïence ware. The Crane bath is fitted with Stothert & Pitt's patent hydraulic lift and special chair, by means of which patients unable to walk are lowered into the bath. The length of the baths is of porcelain, and has a mahogany framing and tops. The combination baths are fitted up with the Harrogate combination needle bath, having a rising and falling floor, worked by hydraulic lifts. In some of the rooms running sitz baths will be provided, and there will be a Bertholet special vapour apparatus. The whole of the bath-room floors are laid with terrazzo marble pavement. The floor of the large dressing hall is laid with polished oak parquet; the exteriors of the dressing-boxes are in French-polished walnut-wood. In all the bath-rooms there are radiators for warming the rooms. The following firms are engaged on the work :—Mr. Isaac Gould, Hunslet, masonry, bricks, and joiners' work; plumbing, Messrs. Braithwaite & Co., Leeds; hot-water engineering, Mr. Edward Oldroyd, Leeds; plasterers, Messrs. Johnson & Sons, Mirfield; painter and decorator, Mr. J. T. Pollard, Leeds; slater, Mr. J. Shepherd, Harrogate; mosaic pavement, Mr. J. F. Ebner, London; concrete-floor laying, Mr. S. McFarlane, Leeds; tiling, &c., Messrs. J. Wedgwood & Sons, Stoke. Mr. William Bennett is clerk of the works. Illustrations of the building have appeared in our issues for August 2, 1890, and May 9, 1891.

SCHOOLS, BRISTOL.—Sir Charles Dilke has just opened the new Greenbank Schools, St. George's, Bristol. The schools, together with the acre and a quarter of land upon which they are built, have cost about £13 000, and they will accommodate nearly 1,000 children, and be divided into three sections—one for boys, another for girls, and a third for infants. The building itself, which has been constructed by Mr. Fred Martin, of St. George, from the designs of Mr. F. Bligh Bond, is on the modern central hall principle. There is a large hall in the middle, from which the various class-rooms radiate. Two large playgrounds have been constructed on the space not occupied by the buildings. There is a room fitted up with all the latest facilities for cookery lectures.

TOWER, NEW SHOREHAM CHURCH.—The restoration of the tower of New Shoreham Church is now in progress, under the direction of Mr. B. Engel, architect, and Mr. Thompson, builder.

WELSH BAPTIST CHAPEL, CADOXTON-BARRY.—The foundation stone has just been laid of a new Welsh Baptist Chapel, in Court-road, Cadoxton. Plans for the new edifice were provided by Mr. Williams, architect (late Messrs. Bruton & Williams), Cardiff, and the tender of Mr. John Griffiths, builder, Barry Docks, was accepted for the erection of the building at a cost of about 1,620*l.*, providing accommodation for about 450 worshippers.

RESTORATION OF THE OLD CHURCH, BOTHWELL.—A meeting of the heritors of Bothwell was held in the Parish Church on the 25th ult. to take into consideration the question of the restoration of the old church. Dr. Pagan submitted plans which had been prepared by Dr. Rowand Anderson. They included (1) the lowering of the roof of the sacristy to its original height; (2) restoring the stone mullions on the east and south windows; (3) replacing the broken-off stone carvings connected with the sedilia and piscina; (4) lowering the ground round the church and the floor to its original level; (5) repairing the walls and roof; (6) heating, furnishing, and slating the church. He stated that the estimates which had been taken for the restoration of the building amounted to 1,700*l.* After consideration, it was agreed to approve of the plans.

PUBLIC SCHOOL, BISHOPBRIGGS, LANARKSHIRE.—A new public school, which has been built by the Cadder School Board, was opened at Bishopbriggs on the 25th ult. The new building is estimated to cost about 4,500*l.* In the front there are two gables with a tower in the centre. The entrance to the school is at the base of the tower, and leads directly into a large central hall, which will be used for drill. Then to the right, off the tower, there are two rooms for the teachers. The central hall is surrounded by the class-rooms, seven in number, capable of giving accommodation for 420 scholars. The tower is supplied with a clock, and the top of the tower, as well as the ridges of the roof, are of red tile. Behind the school a new residence is being erected for the headmaster. The architect of the whole is Mr. David Sturrock, and the principal contractors are—for the mason-work Mr. John Marshall; and for the joiner-work, Messrs. Kemp & Sons, Bishopbriggs.

CATHOLIC SCHOOL-CHAPEL, BOOTHSTOWN, LANCASHIRE.—The foundation-stone was recently laid of a Roman Catholic school-chapel at Oak Lea, Boothstown. The school-chapel, which is dedicated to the Holy Family, is on the Astley side of Boothstown. The new school-chapel is arranged for a mixed school, and consists of a school-room, 48 ft. by 22 ft., and, divided from it by sliding glass partitions, a class-room, 27 ft. by 18 ft., with porches and hat-rooms for boys and for girls and infants, and the usual offices. A portion of the school-room will be screened off as a sanctuary, and the whole will be used on Sundays and holydays as a chapel, which will accommodate 240 people. The building will be faced with local bricks, relieved by red pressed bricks and Rainhill stone. Messrs. Sinnott, Sinnott, & Powell, of Liverpool and Manchester, are the architects, and Mr. Frank Clarke, of St. Helens, the contractor.

NEW THEATRE, WEST BROMWICH.—On the 26th ult., the new Theatre Royal, which has been erected in Walsall-street, West Bromwich, on the site of the building which was destroyed by fire in September, 1895, was opened. The theatre will cost, when completed, between 6,000*l.* and 7,000*l.* The theatre is placed in direct telephonic communication with the Central Fire Station. The contractors are Messrs. Bradley & Lloyd, of Wolverhampton, and the decorations have been carried out by Messrs. A. R. Dean & Co., Birmingham. For the illumination of the stage and auditorium a special system of flash lighting has been introduced, this having been executed by Messrs. Tollerton & Co., Leeds. The architects are Messrs. Owen & Ward.

SCHOOL-CHAPEL, SHIPHAY COLLATON, DEVONSHIRE.—At Shiphay Collaton, near Torquay, the foundation-stone was laid recently of a school-chapel, to be built at a cost of about 2,200*l.* The building, of which Mr. E. H. Harbottle, Exeter, is the architect, and Mr. E. Mudge the builder, consists of nave, transept, large chancel, large vestry, and organ loft. It will be of local red stone with dressings of yellow freestone. Pulpit, font, organ, choir stalls, and reading desk will be provided; the chancel will be tile-floored, and the nave floor will be of wood block.

LIBRARY, ST. PHILIP'S, BRISTOL.—The new building which will serve as a branch free library for the eastern portion of Bristol is now approaching completion. The building, which is in the Renaissance style, is from plans prepared by Mr. H. V. Gough. The vestibule within the main entrance opens into the great hall. The major portion of the floor space is set apart for the news-room, from which the reading-room will be screened off. In an angle of the building are the bookshelves, which are arranged to accommodate from twelve to fourteen thousand volumes, and the counters for the reception and issuing of books. There are also a librarian's room, an assistant's room, and the usual offices, whilst in the basement storage space has been arranged. The whole building will be lighted by the electric light.

BOARD SCHOOL, HARROGATE.—The Harrogate School Board has nearly completed two new schools—one in Cold Bath-road, to be called the Western Board School, to accommodate 910 children, and another in Grove-road, for 1,200 children. The Grove-road Board School is a three-storied building, which, with the usual adjuncts, is estimated to cost over 14,000*l.* The principal entrance faces Grove-road. The main gable will be flanked on either side by projecting wings containing the staircases, lavatories, cloakroom, &c., with a similar arrangement at the south front. The ground floor contains a large central hall, 78 ft. by 32 ft., with three class-rooms 25 ft. by 24 ft. on either side, separated from the central hall by glazed wood screens. The other floors are similar to this, all being lighted by large windows opening into the end gable, and by side lights. There are exits provided for cases of fire. White salt-glazed bricks have been used for facing purposes. The floors are fire-proof; steel joints and girders carry the floors, which have been covered with wood blocks bedded in asphalt composition. The buildings will be heated by hot water on the low-pressure system. The Board is about to erect a laundry, cookery, and manual instruction centre to supplement the other buildings in connexion with Grove-road Board School. This section is to cost between 1,500*l.* and 2,000*l.*, it is thought. The architect of the whole is Mr. Marshall, Harrogate.

PROPOSED NEW ARCADE, SOUTHAMPTON.—There will be fifteen shops in the proposed new arcade (at the Tramway Junction), most of which will also have windows and entrances towards the road. Each will have a large store under and a store-room over. The stores are all entered from a subway running under the arcade pavement, and approached by steps and a gate towards West Park. Circular staircases connect each shop with its store and showroom. The arcade will be 17 ft. wide and 120 ft. long and 30 ft. high. Plate-glass shop fronts fill up the lower story, with pieces of red and white stone between. The upper story inside the arcade will be covered with wall tiles, except where the showroom windows overlook the arcade. There will be a musicians' gallery over the Above Bar entrance, and a glass roof over the arcade. After the design for the arcade, consisting of two stories and a basement, had been completed, the architect was asked to add a story over the whole of the shops towards the road, containing double rooms for bachelors, and accommodation for a caretaker, the whole to be distinct from the arcade, and approached by a separate entrance. These rooms will overlook the road and park, all having bow windows. There will be a fire-resisting floor under, and flat promenade roof over all. There are staircases at each end of the corridors, and windows overlooking the arcade and its roof on one side. This top story will be tile hung towards the road and park. The rest of the work will be done with red brick and stone, with bands of tinted cement work. The main roof will be laid with asphalt, upon which shrubs and seats will be arranged. There will be over 400 steel girders in the building. The red stone is from Nottingham; the polished granite columns at the entrances from Aberdeen. Messrs. Stevens are engaged upon the work up to the first floor. The public pavement will be considerably widened in Above Bar-street by the erection of the arcade; glass screens will protect the entrance, and there will be wrought iron gates to close at night. Mr. R. M. D. Lucas is the architect.—*Hampshire Independent.*

## *SANITARY AND ENGINEERING NEWS.*

SEWAGE DISPOSAL, POCKLINGTON.—A scheme of main sewerage and sewage disposal for the town of Pocklington, near York, having been submitted to the Local Government Board, a local enquiry has been held by Mr. G. W. Willcocks, M.Inst.C.E.,

one of the Engineering Inspectors. The scheme comprises 3½ miles of main sewers, with complete appurtenances, including Hassall's pipes. Flushing is provided by means of Adams's automatic flushing tanks, each of 1,000 gallons capacity, placed at the head of all sewers. The purification of the sewage will be effected by chemical precipitation in the use of alumino-ferric and artificial filtration through coke breeze. Land for final filtration is provided, as required by the Local Government Board, so as to obtain sanction to a loan for thirty years, and to secure an effluent up to the standards of the River Pollution Commission. It has been necessary to obtain a provisional order for the compulsory purchase of the land, which has now been satisfactorily acquired. No objection was made by the Inspector to the scheme, the various details of which were explained by the engineer, Mr. D. Balfour, of Newcastle-on-Tyne.

DEEP SEA PIER, HERNE BAY.—The ceremony of securing the first pile of the deep sea pier at Herne Bay has just been performed by Mr. W. C. W. Prescot Westcar, J.P. The new pier is to extend three-quarters of a mile into the sea so as to be available to steamers at all times of the tide. The pier until recently existing was built in 1873, and was only 320 ft. long. This has now been entirely reconstructed, and will form the shore end of the new pier, which, including the present portion, will extend 3,920 ft. from the shore. It will be 20 ft. wide, and at the pier head the deck will be widened out to 76 ft. for a length of 76 ft., so as to afford space for a pavilion. The pier, except the timber deck (which will be about 15 ft. above high water) will be entirely built of steel and iron. The designs have been prepared by Mr. Ewing Matheson, M.Inst.C.E., London, and the work has been entrusted to Messrs. Head, Wrightson & Co., Limited, Teesdale Iron Works, Thornaby-on-Tees.

WATER SUPPLY, BISHOPS STORTFORD. — In September last year Mr. Scott, engineer, was instructed to prepare a scheme for increasing the water supply of Bishops Stortford. This he did, and the works are now completed. A well was sunk down into the chalk 170 ft. and 6 ft. diameter, but with very little result. It was then decided to drive two tunnels, one to the old well 5 ft. wide and 6 ft. high, and the other in a northerly direction. This was done, and after cutting in 5 ft. a large supply of water was met with. To complete the works one set of 9-in. pumps and one set of 7½-in. pumps have been working to keep the water down, raising 35,000 gallons per hour. The work of sinking the well and fixing the pumps has been carried out by Messrs. W. Brown & Son, contractors, Tottenham.

## *STAINED GLASS AND DECORATION.*

WINDOW, ST. JAMES'S CHURCH, BRIGHOUSE.—There has just been placed in this church a stained-glass window, which was designed by Mr. Kempe. The new window is of two lights.

MEMORIAL WINDOW, WORCESTER CATHEDRAL.—A new window by Messrs. Hardman, of Birmingham, has been erected in the chapel on the south side of the choir in the cathedral by Admiral Britten, to the memory of his father and mother.

SCREEN, &C., DODBROOKE, DEVONSHIRE.—The first section of the restoration of the rood screen in the old parish church at Dodbrooke has just been carried out. Further, an east window, painted by Mr. Fouracre, of Plymouth, has been erected in the chancel, as a memorial to the late Mr. and Mrs. A. E. C. Strickland, of Oaklands, Dawlish. The central group of this window represents the Crucifixion, and in the other lights respectively are the Blessed Virgin, St. John, St. Augustine, and St. Thomas à Becket. The central part of the rood screen may now be said to be almost practically the same as it was originally, save that it yet lacks the figure of the Crucified Christ. The whole of the work in connexion with the (part) restoration of the screen has been carried out by Messrs. Harry Hems & Sons, Exeter.

## *FOREIGN.*

FRANCE.—The medal which M. Chaplain is to engrave for the Emperor of Russia is to be of gold, and will have on the obverse the profiles of the Czar and Czarina, and on the reverse an allegorical subject which has not yet been determined on.——After several years of interruption, work has been resumed on the Ecole de Médecine at Paris. The old houses in the Rue Hautfeuille and Rue de l'Ecole de Médecine are to be pulled down and a new block of buildings erected on their site, which will complete the architectural design of this great scientific institution. The erection of a grand entrance to the Faculté de Médecine is also to be commenced, facing the Boulevard Saint-Michel.——An important architectural competition is to be opened at Courbevoie, for a large group of scholastic buildings.——A new bridge is to be built over the Seine, opposite the village of Alfortville.——The monument erected to General Barbanégre, at Pontacq, is the work of M. Marqueste as sculptor, and M. Cottet as architect. That to Doudart de Lagrée, at Grenoble, is by M. Recoura, architect, and M. Rubier, sculptor. This latter, in reference to the scene in which the subject of it met with his end, is in the Kmer style, and has almost the appearance of a Pagoda from Ang-Kor.——The works are shortly to be commenced for the construction of a bridge over the Rhone between Jons and Nievroz, to put into communication the Departments of Ain and Isère. The cost is estimated at 250,000 francs.——A new Casino is to be built at Tréport, from the plans and under the direction of a Paris architect.——Some important improvements, including the laying out of new avenues, are to be carried out in the Tête d'Or Park at Lyons.——The Société des Architects of Aisne has addressed a memorial to the Prefect of the Department, protesting against the action of the Commune of Vasseny in entrusting the restoration of the choir of its church not to an architect, but to the district road surveyor, whose proper duties are merely the keeping of the roads in repair under the surveillance of the officials of the "Ponts et Chaussées:" a protest certainly not made without reason.——The monument to Carnot on the Place Richelieu at Bordeaux is to be inaugurated on the 13th.——An art exhibition, limited to artists of the district, has been opened at Châlons-sur-Marne, and will be open till the 15th. An art exhibition is to be opened at Nancy on October 11, to remain open till November 15.

INDIA.—A discovery that promises to be of incalculable value to the history of ancient civilisation in India, and of exceptional interest to antiquarians, has just been made by Mrs. Condon, a lady interested in these matters. The find alluded to is located in the Western Dun, and to all appearance it is a buried city with well-preserved indications of walls and fortifications, and is believed to belong to the reign of Asoka, and the discovery of a pillar of this king close to the scene of the find confirms the opinion. Further excavation has been postponed till the cold weather, when it is expected that very gratifying results, elucidating the ancient civilisation of India, will be yielded.—*Indian Engineering.*

## *MISCELLANEOUS.*

EXCAVATIONS IN CARDIFF CASTLE.—The excavations of the Grey Friars Monastery in the grounds of Cardiff Castle are being rapidly proceeded with, and the outline of the church, which must have been an exceedingly fine one of fourteenth century date, is now clearly to be traced. Several skeletons (no doubt of Cistercian monks, inhabitants of the monastery) have been found interred close to the walls, with the feet pointing towards the east. The foundations of the nave arcade piers are all exposed to view. They are about 5 ft. square, and portions of the moulded arch stones and label mouldings have been found lying close to the masonry, where they fell when the church was demolished at the dissolution. A great portion of the masonry of the walling has been torn up, and, no doubt, used in the buildings in the neighbourhood of Queen-street. The church is situated in the middle of the Marquess of Bute's garden, and was found after many months of excavation. The nave is about 112 ft. in length by 65 ft. in width, including the aisles, and the chancel is about 30 ft. across. Mr. C. B. Fowler, architect, of Cardiff, is superintending the work for Lord Bute.—*Western Mail.*

CHIMNEY FELLING BY FIRE IN COVENTRY.—A tall chimney has just been successfully demolished by fire in Coventry. The shaft in question was a strongly-built one, 80 ft. high and 7 ft. square at its base. It stood in a garden at the back of Gilbert-street, adjacent to a field adjoining the Sparkbrook Cycle Works. Its demolition was rendered necessary by some building alterations in Gilbert-street. The chimney stood in close proximity to some of the houses, and Mr. H. C. Whincop, of Birmingham, carried out the work of demolition. The side of the stack furthest from the buildings was carefully undermined, and about two-thirds of the base of the chimney cut entirely away piece by piece. The brickwork was replaced by stout wooden props, until the greater part of the weight of the stack rested upon the timber. Then these props were thoroughly saturated with petroleum, and the cavity made filled with shavings and tarred wood, so as to ensure perfect combustion. The first part of the process was now complete, after some twelve hours' labour. It then only remained to set on fire the wood for the chimney to fall. The combustibles were ignited at six o'clock, and soon the fire was roaring fiercely. After the lapse of some time, the tall erection, with a rending sound, leaned slowly forward, and crashed down into a heap of smoking rubbish. When the dust had cleared away, it was seen that the demolition had been thoroughly successful, not a single brick having fallen towards the houses.

DILAPIDATIONS AT SOMERSET HOUSE.—The Board of Works Department has just discovered, it is stated, serious dilapidations in the ornamental stonework upon the façade of Somerset House in the Strand. It appears that the coat-of-arms which tops the frontage, together with the four huge figures in Caen stone that decorate the building, have been found to be rapidly crumbling to pieces. Some very dangerous indications of this decay were afforded within the past few days. The coat-of-arms and some of the figures were found to be shedding portions of their ornamental works, much to the danger of foot passengers. The intention is to remove the decaying ornamental figures and supply their places with new and more substantial designs.

PUBLIC IMPROVEMENTS, SHEFFIELD.—Application having been made by the Sheffield Corporation to the Local Government Board for sanction to borrow nearly a quarter of a million of money to defray the cost of various public works, Colonel Hasted, R.E., an Inspector of the Local Government Board, held an inquiry at the Sheffield Town Hall, on the 28th ult., into the character and scope of the works and improvements proposed to be carried out. Amongst those present were Mr. E. M. Eaton, Chief Engineer to the Water Department; Mr. W. Terrey, Manager of the Waterworks; Mr. C. F. Wike, City Surveyor; Mr. W. Fisher Tasker, City Accountant; and Mr. Ward, of the City Surveyor's Department. The sums sought to be borrowed are 59,772*l.* for the Crofts improvement scheme, 62,205*l.* for street improvements, 3,727*l.* for Hillsbro' and High Hazels Parks, 6,030*l.* for the extension of Endcliffe Woods, 19,140*l.* for the provision of a highway depot at Olive Grove, 30,354*l.* for public baths, 16,008*l.* for a refuse destructor at Lumley-street, Attercliffe, and 19,541*l.* on waterworks account. The first application dealt with was that for the purposes of water-supply, it being explained by Mr. Eaton that the money was required for works to be carried out by March next. The Dam Flask reservoir was, he said, nearly completed. It was partially filled with water, and the work of pitching was being proceeded with. A portion of the loan was needed to cover this expenditure. With regard to the loan of 6,030*l.* for the extension of Endcliffe Woods, the inspector was informed by Mr. Sayer, the Deputy Town Clerk, that the Corporation owned Endcliffe Woods, and by making the proposed addition to it there would be a lovely walk of over two miles. There was little doubt that if the Corporation did not purchase the land, the builders would soon get hold of it. Mr. Sayer informed the inspector that it was the intention of the Corporation to lay a line of tramways along Ecclesall-road, and that it would skirt a portion of the woods. Explaining the loan on account of the parks, Mr. Sayer said the money was needed to make walks, and otherwise improve the parks. At Hillsbro' there was to be a substantial shelter and bathing-shed. A part of the money was wanted to defray the cost of roadways at High Hazels. Mr. Sayer next explained the needs of the Health Committee with regard to the provision of new baths, and the improvement of existing ones. A portion of the loan was needed for new baths at Upperthorpe, and money was also required for the Glossop-road baths. 5,500*l.* was needed for the provision of a ladies' swimming-bath at Glossop-road, and 9,584*l.* for new baths at Brightside, where a site had been acquired. In reply to questions, the City Surveyor said the Glossop-road baths had been a disappointing matter. In one sense it was a cheap bargain, the site being a valuable one, but the difficulties had arisen owing to the foundations being on some old coal workings. There had been serious sinkings, and the baths had leaked as a result. It had cost the Corporation 9,000*l.* to put the baths in order, and the additions would involve them in an outlay of 5,000*l.* Mr. Sayer, dealing with the application to borrow 16,008*l.* for the cost of the refuse destructor at Lumley-street, Attercliffe, said the Corporation felt they were behind the times in the disposal of refuse, and were anxious to do something better in that respect. They were erecting on a suitable site a destructor. The Deputy Town Clerk next dealt with the Crofts Improvement scheme. He said its net cost had been put at 59,672*l.*, but he was disposed to think they had made a slight oversight, and that owing to the restrictions placed upon them they would require 80,000*l.* odd. They had only asked, however, for 60,000*l.*, and would treat that as on account. Details of the scheme having been given by the City Surveyor, the inquiry terminated.

## *CAPITAL AND LABOUR.*

LEEDS BUILDING TRADE DISPUTE.—On the 31st ult. the employers in the Leeds building trade met the representatives of the men in conference, before the local Conciliation Board. The meeting took place at the Royal Exchange Buildings. Mr. Jonathan Peate (President), Mr. William Marston (Vice-president), and Mr. Rhodes K. Calvert and Councellor Connellan (Secretaries) represented the Conciliation Board; the master builders were represented by their Strike Committee, and delegates from the two operative Unions and the Labourers' Society attended on behalf of the men. The proceedings were of a private nature. At their conclusion the President of the Conciliation Board, with the concurrence of the two parties to the dispute, supplied an official report. He said he regretted to say that no settlement had been arrived at, though, in the opinion of himself and his colleagues certain points in the dispute had been considerably narrowed down. The position taken up by the masters was that they demanded that all the questions in dispute, including the subject of wages, should go to arbitration. They offered, under certain contingencies, including the acceptance of specified rules, to give an increase of a ½d. per hour both to bricklayers and labourers. As, however, the promised advance

was only one of several proposals, which they considered should be treated as a whole, they objected to one matter being selected and all the others rejected. The two proposals now before the conference naturally reduced the points in discussion to the demand of ½d. per hour advance on the one side, and the offer of ¼d. per hour on the other; and if the parties could have come to terms on the question of wages, the other matters in dispute would have been adjusted by arbitration. The men, however, declined the proposed ¼d. advance, and submitted as an alternative the following:—"If the masters will agree to the advance in wages asked for, we agree to accept the old walking points, and the masters' suggestions as to apprentices, one to five, with the addition that six be the limit, and that binding be optional. We accept this as a final settlement." This was rejected by the masters, who took their stand upon their original proposal to refer everything to arbitration. The President of the Conciliation Board then put before both parties the suggestion that the masters should pay the ¼d. per hour previously offered, and then leave all questions, including that of wages, to an arbitrator. Neither the masters nor the men could see their way to accept this proposal. The representatives of the employers reiterated that if they went to arbitration at all it must be on the whole question. Practically, therefore, their offer of ¼d. per hour is withdrawn.

THE DUBLIN BUILDING TRADES DISPUTE.—The final stage of the building trade dispute in Dublin has been reached, and a settlement acceptable and satisfactory to all parties concerned arrived at. The questions at issue between the carpenters and bricklayers and the master builders was arranged on a satisfactory basis some weeks ago, and both those trades have resumed work. The stonecutters, slaters, and plasterers were, however, still out of work, and some eight or ten days ago the chances of settlement with these bodies appeared remote. The committee of the master builders, to whom the special duties in connexion with the strike have been delegated, met recently at the Grosvenor Hotel. Invitations had been addressed to the representatives of the stonecutters', plasterers', and slaters' societies to attend at the meeting. The deputation from the plasterers were the first to arrive. The rules to govern the working of this trade between the masters and men were discussed and agreed upon after a short time. These rules stipulated for uniformity of working weeks of fifty-four hours all the year round, at a rate of 36s. per week, with artificial light provided where and when necessary. If light is not provided by the employers, then the masters are to be at the loss of the time. About one o'clock the deputation from the stonecutters were received by the masters, and, after a short conference, terms were agreed upon and duly signed. These terms specify a wage of eightpence per hour for a certain specified number of hours per week all the year round. This includes the providing of artificial light during the winter months. In places where artificial light cannot be provided when necessary, and where the hours of work would consequently be less in winter the wage is to be 8¾d. per hour. Finally, the deputation from the slaters were received. The deliberations between the deputation and the masters were equally satisfactory to all parties. Like the other trades bodies concerned the slaters and the masters have discussed the basis of settlement, and fully agreed upon it. Upon the apprentice question it was agreed that in all instances apprentices must produce their certificates, when required by the employers, showing the date when bound—the rate of wages for this class of workers to be regulated by the number of years the apprentices have worked. In the case of a proposed fundamental change in any of the rules, it is specified that three months' notice must be given by the parties advocating the change, a reply to be received one month after by the person or persons to whom such communication has been addressed. The dispute is now finally terminated.

PENRHYN SLATE QUARRIES.—Work is proceeding as usual at these quarries, although at one time matters looked rather threatening, and some of the younger men seemed anxious for a strike. A strike in the present state of trade would have been most detrimental to all concerned.

## *LEGAL.*

### MEESON v. THE LONDON COUNTY COUNCIL.

AT the North London Police-court on the 29th ult. the case of Meeson *v.* the London County Council was heard before Mr. Paul Taylor.

The Council had in 1894 erected a portable wooden shed on Hackney Marsh within 2 ft. of a road, for the use of their workmen engaged in levelling the Marsh. It was 12 ft. long, 9 ft. wide, and of the average height of 9 ft. 6 in., the height to the eaves being 7 ft. 4 in. It was constructed of timber framing with a floor. The sides were covered with weather-boarding and the roof with felt. It had a door and a window. The shed was discovered by Mr. Frederick Meeson, the District Surveyor for East Hackney North, on March 6, 1896, and he had claimed a fee of 15s. in respect of it which the Council had refused to pay. The shed had been since moved from time to time as the work required.

Mr. Meeson had on April 10 summoned the Council under the London Building Act, 1894, for erecting the shed without notice to him as District Surveyor. This summons was dismissed on the ground that the shed was erected before the 1894 Act came into force, it being then stated that the Council had a good defence under the 1855 Act. Mr. Meeson on April 15 sent in two accounts for the fee, one under the 1855 and one under the 1894 Act, and some correspondence ensued, the Council's solicitor pointing out grounds on which the Council declined to pay.

Mr. Geoghegan (instructed by Mr. Jutsum) contended, on behalf of the District Surveyor, that the shed was a building, and that, being a building, the District Surveyor was entitled to the fee claimed under the Metropolitan Building Act, 1855, sec. 49, and Schedule II. and he cited the cases of Stevens v. Gourley (29 L.J., C.P. 1), Richardson v. Brown (49 J.P. 661), adding that "building" had never been defined in an Act of Parliament.

The complainant was called and bore out his counsel's opening statement, but before he was cross-examined the Magistrate suggested that the proceedings might be shortened if the line of defence were indicated at that stage.

Mr. Seager Berry on behalf of the Council thereupon stated that the defences were four.

1. This shed was not a "building."
2. The work the Act required the District Surveyor to do to earn the fee had not been done.
3. The shed, if a "building," was a "building" exempted from the 1855 Act by Section 6.
4. The shed was specially exempt under the London Open Spaces Act, 1893.

Mr. Paul Taylor said they had better proceed by stages, and that he wished the question of "building" dealt with first.

Mr. Berry said this defence was, from a public point of view, most important, as being of general application; the Act of 1855 allowed a fee for a "building," and this Act only contemplated two classes of building—(1) what he should call ordinary brick and mortar constructions, and (2) special buildings coming within section 56; and he referred to Sections 45, 46, 47, 53, and the first schedule. The case of Stevens v. Gourley showed that both these classes were of a permanent character Wooden structures or erections of a movable or temporary character could not be dealt with in London till 1882, when Section 13 of the amending Building Acts 45 Vict., c. 14, made it unlawful to erect them without a licence from the late Board of Works (now the Council); that section gave power to annex conditions to licences, and a District Surveyor's powers over such structures only arose if the Council (as they usually did) put them under his supervision by a condition in their licence. The case of Richardson *v.* Brown had no application to London buildings, as it was decided on an Act applying only to the provinces. There were several such decisions, but London had always been the subject of special Acts which had special decisions on them; the word "structure" did not appear in provincial Acts, and so "building" had had a wider meaning given it in such Acts than it had had in London Acts. This shed was, if at all, under Section 13 of 45 Vict. c. 14, and the District Surveyor had no power over it, and no notice to him was necessary, nor was any fee due, and he quoted the London County Council *v.* Pearce (2 Q.B. 109; 66 L.T., 685; 40 W.R., 543; 56 J.P. 790).

Mr. Geoghegan, in reply, said he should contend this was a "building." If the shed was under Section 13 of the amending Act, the Council were out of Court, as they required a licence and had not got one.

Mr. Berry said the Council would have a defence if summoned again on that ground, and the magistrate remarked they would hardly need a licence from themselves.

Mr. Geoghegan said he desired to recall his client to prove that magistrates had frequently made orders for these fees in similar cases.

Mr. Paul Taylor said that would not assist him, since, if such orders had been made, they had been made owing to the cases not having been defended on the present lines. He had thought there was much in the claim till he had heard the defence, but he was now satisfied that the Council's contention was correct, and the summons must be dismissed.

Mr. Geoghegan said he should like to know what a District Surveyor's position was as regards these sheds, and whether he was supposed to discover them and to get no fee.

In reply to the magistrate on this point, Mr. Berry said a District Surveyor is supposed to be constantly going about his district and to discover them in his ordinary rounds, and the Acts, especially the 1894 Act, tell him he is to report them to the Council. He is not entitled to any fee for discovering them. If the Council license them he will usually get a fee, owing to the usual condition in the licence.

Some discussion ensued as to costs, Mr. Berry saying that the Council's solicitor pointed out this defence to Mr. Meeson's solicitor on June 22, and asked for a reply, but the only reply he received was a summons served five days ago.

Mr. Geoghegan said he was instructed to say that the solicitor regretted that, owing to pressure of work, he had not replied to that letter, and that Mr. Meeson was in no way to blame; and on the Magistrate suggesting that the application for costs would probably be withdrawn on that explanation, it was withdrawn accordingly.

### CASE UNDER THE LONDON BUILDING ACT. NEGLECT TO GIVE NOTICE: WHO IS THE BUILDER?

AT the North London Police-court on the 26th ult., before Mr. G. Paul Taylor, Mr. George Matthews, of 10, Weston-place, Mare-street, Hackney, N.E., was summoned by Mr. Alexander Payne, the District Surveyor of East Hackney (South) and North Bow, for executing work to or upon a building without notice, contrary to Section 145.

The defendant had constructed the brickwork of an addition to factory premises in the rear of 132, Mare-street, without notice to the District Surveyor, the addition being about 20 ft. long, 10 ft. wide, and 13 ft. high. An opening 9 ft. wide was also made in the wall of the old premises with iron girder over.

The defendant maintained through his solicitor that as in this case the owner, Mr. F. M. Jefferson, was doing his own carpentry, he was really the person causing or directing the work to be executed named in Section 145, and that he ought to have been summoned, and not Mr. Matthews.

The District Surveyor proved that Mr. Matthews was employed as a master builder for the work he had done, and had bought his own materials, and found labour as shown from his account, and contended that the definition 5 (33) which defines the "builder" to be "the person who is employed to build or to execute work on a building or structure," made Mr. Matthews responsible for this work.

The magistrate, after looking carefully into the points raised, came to the same conclusion, but only imposed a light fine under the circumstances, viz., of 10s. and 6d. a day continuing penalty, and costs, amounting altogether to 1*l.* 14s. 6d.

### PARTY-WALL DISPUTE AT HALIFAX: A COMPLICATED ORDER.

MR. MILLAR, Q.C., applied ex parte to Mr. Justice Chitty, sitting as Vacation Judge last Wednesday, the 2nd inst., for an order in the case of Simpson *v.* Collinson, that the defendant, his contractor, servants, agents, and workmen, might be restrained from entering on the land and premises of the plaintiff situate at Halifax, and from heightening or building on the wall dividing the said land.

His Lordship: Is it to restrain building so as to obscure light—not air?

Mr. Millar: It is not a question of light; it is a question of heightening or building on the wall dividing the land of the plaintiff.

His Lordship: No question of light? Is it trespass then?

The learned Counsel said that under an award either party was at liberty to build at the top of the wall according to the satisfaction of the Surveyor for the time being. The plaintiff had done that and no objection had been taken by the defendant for two years; but since the commencement of the Long Vacation he had commenced to pull down the wall the plaintiff had built and to break away the pillars, and went on the plaintiff's land for that purpose.

His Lordship asked if the building of the plaintiff was in accordance with the award.

Mr. Millar replied that it was, and that the wall was a party-wall. The plans had been before the Surveyor and the Town Council, and had been approved of.

His Lordship: Have you built to the satisfaction of Mr. Utley (the Surveyor)?

Mr. Millar: Yes, and what we have built was built two years ago, and the defendant is pulling part of it down. Your Lordship will observe that upon the award neither party is to interfere, or to build without paying half the cost; so in addition to his acquiescence for two years the defendant has not gone through the formality of paying half the costs, or, in other words, he has no interest in it whatever. I have a telegram which was put into my hands this morning, which shows the necessity for my troubling your Lordship with this matter.

His Lordship: You may take an injunction over Wednesday next to restrain the defendant from entering on your land and premises, and so forth, and from continuing to build a wall on the plaintiff's land.

Mr. Millar: No, on the party-wall.

His Lordship: I want the injunction clear, please; on the plaintiff's—what?

Mr. Millar: It is not the plaintiff's land. It is a party-wall.

His Lordship: Continue to build a wall there—on the what?

Mr. Millar: On the wall dividing the land and premises of the plaintiff, and on the adjoining land and premises of the defendant.

His Lordship: Well, you may take it in that

# COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

## COMPETITIONS.

| Nature of Work. | By whom Advertised. | Premiums. | Designs to be delivered. |
|---|---|---|---|
| *Infirmary | Farnham and Hartley Wintney Sch. Mngrs. | ..... | Oct. 13 |
| *Coroner's Court, Mortuary, &c. | Poplar Bd. of Works | 30l. and 20l. | Oct. 26 |
| *New Hospital, Newport | Newport & Monmouth Hospital Committee | 100l. and 50l. | Dec. 1 |

## CONTRACTS.

| Nature of Work or Materials. | By whom Required. | Forms of Tender, &c. Supplied by | Tenders to be delivered. |
|---|---|---|---|
| Sewers, &c. | Bromsgrove R.D.C. | W. Fiddian, Surv. Town Hall, Stourbridge | Sept. 7 |
| Residence, Caheragh, co. Cork | Rev. T. Palmer | S. F. Hynes, Archt. 41, South Mall, Cork | Sept. 8 |
| Road Works, Longshott-lane | Easthampstead R.D.C. | C. J. Cave, Clerk, Bracknell | Sept. 9 |
| *Granite Spalls and Broken Granite | Hackney Vestry | J. Lovegrove, Vestry Hall | do. |
| Laying Cast-iron Pipes, Hamilton, N.B. | District Committee Lanark C.C. | Leslie & Reid, Engr. 72, George-street, Edinburgh | Sept. 10 |
| Offices | Aberdeen School Bd. | A. M. Mackenzie, Archt. 1, Bon Accord-street | do. |
| Roman Catholic Church, Llagriffin, Buttevant, Ireland | ..... | S. F. Hynes, Archt. 41, South Mall, Cork | do. |
| Four Houses, Savile Town, Dewsbury | ..... | R. Castle, Archt. Huddersfield | do. |
| Residence, Stables, &c. Dougland Heath, Colchester | ..... | C. E. Butcher, Archt. 3, Queen-street, Colchester | Sept. 12 |
| Whinstone Paving, &c. | Alnwick R.D.C. | H. W. Walton, Alnwick | Sept. 14 |
| Footpaths, &c. Denaby | Doncaster R.D.C. | F. E. Nicholson, 21, High-street | do. |
| *Erection of Brewery | Bath Brewery Co. Lim. | G. Adlam & Son, Engr. Bristol | do. |
| Sewer, &c. Heaton, Mersey | Heaton Norris U.D.C. | J. Green Banks, Clerk, Council Offices | do. |
| *Removal of Dust, Ashes, &c. | Rotherhithe Vestry | Vestry Offices | do. |
| *Additions to Asylum | Wilts County Asylum | The Asylum, Devizes | Sept. 15 |
| *Officer's House, Coastguard Station, Whitstable | Admiralty | Director of Works, 21, Craven-st. Charing Cross | do. |
| Extensions, &c. Electric Light Buildings | Oldham Corporation | A. Andrew, Gas & Water Offices, Oldham | do. |
| *Labour Sheds and Boundary Wall at Workhouse | St. Leonard (shoreditch) Guardians | F. J. Smith, Archt. 17a, Gt. George-street, S.W. | Sept. 16 |
| Additions to Offices, Quay | Southampton Harbour Board | E. C. Poole, C.E. Portland-street, Southampton | do. |
| *Twenty Slop and 4 Two-ton Vans | County Borough of West Ham | L. Angell, Town Hall, Stratford, E. | do. |
| *Making-up Roads | Southgate U.D.C. | C. G. Lawson, Surv. Palmer's Green, N. | Sept. 17 |

## CONTRACTS—*Continued.*

| Nature of Work or Materials. | By whom Required. | Forms of Tender, &c. Supplied by | Tenders to be delivered. |
|---|---|---|---|
| *Temporary Iron Hospital, near Bisley | Stroud Joint Hospital Board | G. P. Milnes, Archt. Stroud | Sept. 17 |
| City Square Improvements | Leeds Corporation | W. Bakewell, Archt. 38, Park-square, Leeds | do. |
| *Supplying and Laying Road Materials | StokeNewingtonVestry | S. E. Burgess, Engr. at Vestry Offices | Sept. 19 |
| *Extensions to Asylum, Wakefield | West Riding C.C. | J. Vickers-Edwards, County Surv. Wakefield | Sept. 21 |
| Offices, Hull-st. Blackpool | Fylde Waterworks Co. | Mr. Garlick, Engr. 33, Winckley-sq. Preston | do. |
| *Making-up and Paving Streets | West Ham Council | Lewis Angell, Boro' Engr. Town Hall | Sept. 22 |
| *Broken Granite | Edmonton U.D.C. | G. E. Bachus, Engr. Town Hall | do. |
| *Making-up, &c. Roads | Chiswick U.D.C. | A. Ramsden, Surv. Vestry Hall | Sept. 23 |
| *Additions to Board School, Shoeburyness | South Shoebury School Board | Burles & Harris, Archt. Southend | Sept. 24 |
| *Re-erection of Baths Building | Hampstead Vestry | Spalding & Cross, Archt. 15, Queen-st. E.C. | do |
| *Foundations and Baths | Hull Corp. | Borough Engineer | Sept. 25 |
| Pier, Freswick | Caithness C.C. | J. J. Cronin, C.E. Wick. | do. |
| Mortuary, Durham County Hospital, Durham | ..... | C. H. Fowler, Archt. The College, Durham | Sept. 29 |
| *Pulling Down and Erection of Infirmary | Bethnal Green Guar. | Giles, Gough, & Trollope, 28, Craven-st Strand, W.C. | Oct. 6 |
| *2,000 Tons Tough Puddling Clay | LondonCountyCouncil | Manager, Works' Dept. | No date |
| Station Buildings, Barmby | Hull and Barnsley Ry. Co. | Engr. Alexandra Dock, Hull | do. |
| Boarding House, &c. Bridlington Quay | ..... | Chorley & Connon, Archt. 15, Park-row, Leeds | do. |
| Villa, Fort William Park, Belfast | ..... | Young & Mackenzie, Engr. Donegall-sq. | do. |
| Additions to Wesleyan Chapel, Wilton-road, Salisbury | ..... | F. Bath, Archt. Crown-chambers, Salisbury | do. |
| Bank, Bull-ring, St. Austell, Cornwall | ..... | S. Trevail, Archt. Truro | do. |

## PUBLIC APPOINTMENTS.

| Nature of Appointment. | By whom Advertised | Salary. | Applications to be in. |
|---|---|---|---|
| *Inspector of Nuisances, &c. | Watford R.D.C. | 180l. | Sept. 9 |
| *Resident Teacher of Building Construction, &c. | Kent & Surrey C.C.'s | 100l. with board and lodging | Sept. 12 |
| *Cemetery Superintendent | Commrs. of Sewers | 200l. per annum, house, rates, taxes, &c. | Sept. 15 |
| *Chief Engineering Assistant | Blackburn Corp. | 180l. | Sept. 19 |
| *Assistant Surveyors, (R.E. Civil Staff) | Civil Service Commrs. | ..... | Oct. 8 |

*Those marked with an asterisk (*) are advertised in this Number.* *Competitions p.* iv. *Contracts, pp.* iv., vi., *&* viii. *Public Appointments, pp.* xvi. *&* xix.

form. And from pulling down, or otherwise damaging, or interfering with plaintiff's—what?

Mr. Millar: Not interfering—damaging the said wall.

His Lordship: Very well. You are going to take this injunction at your own risk, you know.

Mr. Millar: Your Lordship gives me an order in that form over next Wednesday.

His Lordship: Yes. You do not want any liberty to serve?

Mr. Alexander, Q.C., present on behalf of the defendant, said that he would accept the notice of motion as good for next week.

Mr. Millar said that he might have to ask his Lordship for leave to amend the notice of motion by asking for leave to pull down.

His Lordship: Then you will have to serve notice of motion.

Mr. Millar: Yes.

## MEETINGS.

SATURDAY, SEPTEMBER 5.

*Devon and Exeter Architectural Society.*—Excursion to St. German's Church. Depart from Devonport Station (G.W.R.) at 3.16 p.m.

## RECENT PATENTS:

### ABSTRACTS OF SPECIFICATIONS.

10,500.—WINDOW SASH AND LINK: *C. Shakeshaft.*—In place of carrying grooves for supporting cords only a short distance down side of sash, inventor carries grooves right down sides of sash, and, in the case of the lower sash, the groove is continued partially or wholly across under side of bottom rail with large sashes; a new cord can be inserted without removing sash or bead work.

14,280.—BRICKBURNING KILNS: *G. Leman.*—Has for its object the utilisation of the "after heat" from a burnt kiln; one of a series; for drying unburnt bricks in another kiln of the series. The series of kilns is provided with a bottom flue, and another above, with suitable doors and dampers for the regulation of the heat.

14,463.—WINDOW FRAMES: *W. C. Simpson.*—The "revolving window frame" of this invention is an ordinary frame carrying sashes and weights made to revolve perpendicularly, and within an outer framing, by being mounted on a pivot in sill and another in upper part of frame.

14,538.—CHIMNEY POT OR COWL AND VENTILATOR: *E. J. Borland and Another.*—The pot of any suitable material is octagonal on plan, preferably about 12 in. by 9 in. base, 9 in. by 9 in. top, and height according to position. It is provided with two inlets on opposite side and at different height, each furnished with a detachable hinged flap, supported in two grooves. Inventor claims that his improvements prevent down draught and dislodgement of soot by rain.

16,540.—DOOR HINGES: *D. Smith.*—To ensure the automatic closing of doors inventor forms on the pivots and on a sleeve on their sockets half screws, or duplex inclined planes, for the purpose of reducing friction. With these is combined a spiral spring.

21,330.—GLAZING ROOFS: *R. Roberts.*—A glazing bar of T iron with the ends of the T turned up at right angles is employed. The extremities of these turned-up portions are reversed longitudinally to receive lead or other soft material for the glass to bed on. The top of T piece thus forms a chamber. Studs with screw nuts are tapped into centre of glazing bar at intervals for holding zinc or lead caps to secure glass.

7,139.—APPARATUS FOR CLOSING DOORS:—*J. Schaibe.*—The invention is mainly directed to the prevention of the slamming of doors exposed to high winds or draughts, and consists essentially in the addition of a cranked link and rubber buffer for door-closers.

### NEW APPLICATIONS FOR LETTERS PATENT.

AUGUST 17.—18,177, C. Heineman, Water Waste Preventer for Flushing Purposes. — 18,190, J. Spencer, Ladders.—18,210, W. and T. Griffiths, Roofing Tiles.

AUGUST 18.—18,238, T. Yardley, Tongue and Grooved Stoneware, or Earthenware Socketed Pipe for Sanitary Purposes. — 18,295, J. Kleine, Fireproof Ceilings and Floors.—18,314, A. Brindle, Casement or Sash Fastener.

AUGUST 19.—18,349, R. Trainor, Fastenings or Locks for Window Sashes, Show-cases, &c.—18,399, G. Adams and R. Menzies, Ventilating Devices.

AUGUST 20.—18,424, S. Adams, Moulding Presses for Bricks, Tiles, &c.—18,431, Gammon & Son, Automatic Syphon Flushing Cistern, with Self-Closing Valve.—18,434, J. and A. Proctor, Hinge.—18,468, R. Evered, Flushing Cisterns.

AUGUST 21.—18,503, H. and R. Lanceley, Manholes and Ventilator Frames and Covers, &c. — 15,807, P. Brownlie, Water-closets, Urinals, and Slop Sinks.—18,529, E. Hutchinson, Window Fasteners.—18,541, C. Hoffman, Window Fastener, &c.

AUGUST 22.—18,576, W. Wheeler, Syphon Cistern.—18,581, W. Maguire, Decorating Tiles.—18,597, A. Morrison and M. Ingram, Syphon Cisterns.—18,608, J. Donne, Apparatus for Supporting Window Sashes.—18,522, G. Thomson, Manufacture and Treatment of Artificial and other Stone Roofing, and other Tiles and Enamel, and in Apparatus therefor.—18,623, A. Rammage, Bridge Floors or Decking.

### PROVISIONAL SPECIFICATIONS ACCEPTED.

7,946, H. Stringer, Sash Window Fasteners.—10,028, J. Johnson, Combined Flanged Stench Trap, Cesspool and Mud Receiver.—11,830, A. King, Door Knocker.—14,533, W. Birch, Latch or Fastener for Field Gates.—15,738, G. Kinsey, Stoves.—16,030, Siemens, Brothers, & Co., Rock Drills.—16,263, J. Winn & F. Jones, Holdfasts for Walls.—16,601, F. Follows, Frames and Mountings of Grind-stones.—17,117, W. Bugler, Gully and other Traps.—17,331, P. Negroponte, Window Sash Fasteners.—17,412, O. Steed, jun., Self-closing Taps.—17,419, W. Graves, Window Catches or Fasteners.

### COMPLETE SPECIFICATIONS ACCEPTED.

*Open to opposition for two months.*

18,625, J. Wagstaff, Heat Radiating and Air Warming and Ventilating Apparatus.—19,360, G. Mackie, Door-closing Appliances.—19,610, W. Youlten, Window Fasteners.—22,565, A. Jones, Door Knockers.—3,267, D. Hurst, Water Closets.—7,198, G. Viggars, Brick or Tile Die.

## PRICES CURRENT OF MATERIALS.

### TIMBER.

| | | | |
|---|---|---|---|
| Greenheart, B.G. | ton | 8/c/o | c/o/o |
| Teak, E.I. | load | 10/10/o | 15/10/o |
| Sequoia, U.S.ft.cu | | 2/o | 2/1 |
| Ash, Canada load | | 3/o/o | 4/5/o |
| Birch, do. | | 3/15/o | 5/c/o |
| Elm, do. | | 3/c/o | 4/15/o |
| Fir, Dantsic, &c. | | 1/12/o | 3/10/o |
| Oak, do. | | 2/15/o | 3/15/o |
| Canada | | 5/5/o | 6/15/o |
| Pine, Canada red | | o/o/o | o/o/o |
| Do. Yellow | | 2/o/o | 4/5/o |
| Lath, Dantsic, fath | | 4/10/o | 5/10/o |
| St. Petersburg | | 5/o/o | 6/10/o |
| Wainscot, Riga &c., log | | 2/5/o | 4/10/o |
| Odessa, crown | | 2/5/o | 4/10/o |
| Deals, Finland 2nd & 1st std 10c | | 7/10/o | 8/10/o |
| Do. 4th & 3rd | | 7/o/o | 8/o/o |
| Do. Riga | | 7/o/o | 8/o/o |
| St. Petersburg, 1st yellow | | 10/o/o | 12/10/o |
| Do. 2nd yellow | | 8/o/o | 10/10/o |
| Do. white | | 8/10/o | 11/o/o |
| Swedish | | 7/o/o | 13/10/o |
| White Sea | | 8/o/o | 15/o/o |
| Canada, Pine 1st | | 22/10/o | 25/o/o |
| Do. do. 2nd | | 15/10/o | 16/10/o |
| Do. do. 3rd, &c. | | 8/o/o | 10/10/o |
| Do. Spruce, 1st | | 8/10/o | 10/o/o |
| Do. do. 3rd and 2nd | | 7/o/o | 8/o/o |
| New Brunswick | | 6/10/o | 7/10/o |
| Battens, all kinds | | 5/o/o | 20/o/o |
| Flooring boards, sq., 1 in. prep. 1st | | 9/10/o | 14/o/o |
| Do. 2nd | | 5/6/o | 11/c/o |
| Other qualities— | | 4/4/6 | o/6/o |
| Cedar, Cuba, ft. | | /4½ | /5 |
| Honduras, &c. | | /4 | /5 |
| Mahogany, Cuba | | /4½ | /6 |
| St. Domingo | | | |
| cargo av. | | /4½ | 1/3 |
| Mexican, do. do. | | /4 | /5 |
| Tobasco, do. do. | | /5 | /7 |
| Honduras, do. | | /5 | /6½ |
| Box, Turkey ton | | 4/o/o | 15/o/o |
| Rose, Rio | | 7/o/o | 16/o/o |
| Bahia | | 8/o/o | 15/o/o |
| Satin, St. Doming | | o/o/7 | o/1/o |

### TIMBER *(continued).*

| | | | |
|---|---|---|---|
| Satin, Porto Rico | | o/o/7 | o/1/6 |
| Walnut, Italian | | o/o/3 | o/o/7 |

### METALS.

| | | | |
|---|---|---|---|
| Iron—Pig, in Scotland | ton | 2/6/3 | o/o/o |
| Bar, Welsh, in London | | 5/15/o | 5/17/6 |
| Do. do. at works in Wales | | 5/10/o | 5/12,6 |
| Do. Staffordshire, in London | | 5/15/o | 6/10/o |
| COPPER—British cake and ingot | | 48/10/o | 50/o/o |
| Best selected | | 50/15/o | 51/5/o |
| Sheets, strong | | 55/o/o | 57/c/o |
| Chili bars | | 47/4/3 | o/o/o |
| YELLOW METAL | lb | o/o/5 | o/o/5½ |
| LEAD—Pig | | | |
| Spanish | ton | 20/17/6 | 20/18/9 |
| English com. brands | | 21/o/6 | 21/5/o |
| Sheet, English 6 lbs. per sq. ft. and upwards | | 21/15/o | o/o/o |
| Pipe | | 22/5/o | o/o/o |
| ZINC—English sheet | ton | 20/10/o | o/o/o |
| Vieille Montagne | | 21/5/o | o/o/o |
| Spelter | | 17/2/6 | 17/5/o |
| TIN—Straits | | 59/1/3 | c/o/o |
| Australian | | 59/17/6 | 60/2/6 |
| English Ingots | | 62/10/o | 63/o/o |
| Banca | | 61/o/o | 61/10/o |
| Billiton | | 60/5/o | 60/10/o |

### OILS.

| | | | |
|---|---|---|---|
| Linseed | ton | 26/2/6 | o/o/o |
| Cocoanut, Cochin | | 26/10/o | o/o/o |
| Do. Ceylon | | 23/o/o | o/o/o |
| Palm, Lagos | | 21/o/o | c/o/o |
| Rapeseed, English pale | | 25/10/o | 26/o/o |
| Do. brown | | 24/o/o | 24/10/o |
| Cottonseed ref. | | 15/10/o | 16/10/o |
| Oleine | | 17/o/o | 18/10/o |
| Lubricating U.S. | | o/6/o | o/7/3 |
| Do. black | | o/4/9 | o/6/6 |
| TAR—Stockholm | barrel | 19/6 | o/o/o |
| Archangel | | o/12/6 | o/o/o |
| TURPENTINE—(American) | ton | 18/10/o | o/o/o |

## TENDERS.

**[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.* N.B.—We cannot publish Tenders unless authenticated by the name and address of the sender: and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under £100, unless in some exceptional cases and for special reasons.]**

ABERDEEN.—For additions to public school buildings, Cairnorie, Methlick. Mr. W. Clark, architect, Methlick, Aberdeen:—
*Masonry.*—Milne & Crighton, New Weir, Aberdeen
*Carpentry.*—Francis Fraser, Hillbrae, Methlick
*Slating.*—George Ewen, Tangland, Methlick
*Plastering.*—J. & J. Hutcheon, Methlick
£157 6

ABERGAVENNY.—For part restoration, &c., St. Mary's Church. Mr. E. A. Johnson, architect, Abergavenny:—
J. G. Thomas & Sons, Abergavenny ..... £315

BEXHILL-ON-SEA.—For the erection of business premises and dwelling-house in St. Leonard's-road, Bexhill, Sussex, for Mr. A. T. Gammon. Mr. William Cooper, architect, 21, Havelock-road, Hastings:—

| | | | |
|---|---|---|---|
| A. H. White | £1,335 | Padgham & Hutchinson | £898 |
| H. Cruttenden | 1,095 | Eldridge & Cruttenden * | 895 |

[All of St. Leonards.]
* Accepted.

BOURNEMOUTH.—For erecting chapels and boundary wall at e Bournemouth East Cemetery. Mr. F. W. Lacey, Borough Engineer and Surveyor:—

| | Chapels. | Extra for spire in Portland Stone. | Boundary Wall. | Total. |
|---|---|---|---|---|
| George & Harding | £4,459 | £200 | £625 | £5,284 |
| J. McWilliam & Son | 4,790 | 190 | 595 | 5,114 |
| W. E. Jones & Son | 4,328 | 154 | 598 | 5,080 |
| Jenkins & Sons | 4,469 | 950 | 513 | 5,932 |
| F. Hoare & Sons* | 4,159 | 147 | 560 | 4,866 |

* Accepted.

BRAINTREE (Essex).—For the erection of schools, Manor-street, for the School Board. Mr. J. W. Clark, architect, Coggeshall. Quantities by the architect:—

| | | | |
|---|---|---|---|
| W. E. Letch | £1,750 0 0 | Ernest West, Chelmsford* | £1,563 0 0 |
| W. Parmenter | 1,740 0 0 | H. Potter | 1,559 0 0 |
| Geo. Hunnable | 1,709 14 3½ | J. L. Near | 1,487 5 6 |
| Holland & Unwin | 1,690 0 0 | | |

* Accepted.

BRIDGWATER.—For the erection of schools, Eastover, for the School Board. Mr. A. B. Cottam, architect, Eastover, Bridgwater:—

| | | | |
|---|---|---|---|
| Harris & Tapscott | £2,527 10 | H. W. Pollard, Bridgwater* | £2,120 0 |
| T. Stockham | 2,443 0 | | |
| C. Bryer, Jun. | 2,250 8 | | |

* Accepted.

CASTLEFORD (Yorks).—For the erection of two houses and shop, Savile- and Leeds-road, for Mr. T. Doncaster. Mr. J. A. Clokie, architect, The Potteries, Castleford. Quantities by architect:—

*Building, &c.*

| | | | |
|---|---|---|---|
| E. Wright | £336 0 | R. Walker & Sons* | £326 0 |

*Joinery, &c.*

| | | | |
|---|---|---|---|
| J. H. Whaley & Son | £220 0 | R. Gillatt | £161 10 |
| J. Jowett* | 166 0 | | |

*Slating.*

| | | | |
|---|---|---|---|
| J. Allison | £35 10 | T. Dalton* | £32 0 |
| S. Evison | 32 0 | | |

*Plumbing, &c.*

| | | | |
|---|---|---|---|
| H. Foster | £41 0 | G. Bateson* | £36 0 |

*Plastering, &c.*

| | | | |
|---|---|---|---|
| T. Smithers & Son | £34 10 | F. Brighton* | £25 10 |

*Painting, &c.*

| | | | |
|---|---|---|---|
| T. Watson | £23 10 | J. Foster* | £12 10 |
| A. Frith | 15 10 | | |

* Accepted.
[All of Castleford.]

CHIPPING SODBURY.—For the execution of sewerage works, Wickwar, for the Rural District Council. Mr. J. Fletcher Trew, Engineer, County Chambers, Gloucester:—

| | | | |
|---|---|---|---|
| J. C. Leal | £2,573 0 0 | A. Krauss | £1,931 0 0 |
| Freeman & Jones | 2,275 1 9 | Roach & Son | 1,845 15 11 |
| W. Meredith | 2,185 17 8 | O. S. Scull | 1,643 0 0 |
| L. Lovell | 2,092 13 1 | W. M. Hudson* | 1,515 10 0 |
| J. H. Smith | 1,973 17 4 | | |

* Accepted.

COEDPOETH (Wales).—For the erection of Parish Hall, for the Bersham Parish Council. Mr. J. E. Lash, architect, 5, Temple-row, Wrexham. Quantities by the architect:—

| | | | |
|---|---|---|---|
| Turner Bros. | £1,397 0 | J. Moss | £1,289 0 |
| Wm. Rogers | 1,387 0 | Harrison & Griffiths, Coedpoeth* | 1,260 0 |
| Williams & Wychersley | 1,377 0 | J. Whittingham | 1,250 0 |
| E. Bradshaw | 1,349 10 | | |

* Accepted.

COWBRIDGE (Glamorgan).—For the erection of a bridge, Colhugh-street, Llantwit Major, for the Rural District Council. Mr. Geo. E. Morris, surveyor, St. Quintin's, Llanblethian, Cowbridge:—

*Stone Bridge.*

| | |
|---|---|
| E. Davies | £147 |
| T. H. Davies, Llantwit Major (accepted) | 144 |

*Iron Bridge.*

| | |
|---|---|
| Kyte & Co. | £257 |

[Surveyor's estimate, £146.]

CROYDON.—For rebuilding the Star Inn, London-road. Messrs. Eedle & Meyers, architects:—

| | | | |
|---|---|---|---|
| Smith & Co. | £4,905 | Lascelles & Co. | £4,690 |
| W. Shurmur | 4,895 | Page | 4,655 |
| W. Smith | 4,718 | Wallace | 4,550 |
| Bullock | 4,724 | | |

DONCASTER.—For the erection of new co-operative stores, Goldthorpe-lane Ends, for the Doncaster Mutual Co-operative and Industrial Society, Limited. Messrs. Athron & Beck, architects, Doncaster. Quantities by the architects:—

| | | | |
|---|---|---|---|
| Duncan & Jones | £3,532 12 6 | F. Beastall | £2,675 0 0 |
| Arnold & Son | 2,825 0 0 | Brown & Hamilton | 2,160 15 0 |
| J. Athron, Jun. | 2,750 0 0 | | |

DONCASTER.—For the erection of new shops and extension of mineral water manufactory, High-street-buildings, Doncaster, for Messrs. Heath & Smith. Messrs. Athron & Beck, architects, Doncaster. Quantities by the architects:—

| | | | |
|---|---|---|---|
| Mullins & Richardson | £1,337 | W. Anelay | £1,234 |
| Johnson | 1,320 | Arnold & Son | 1,195 |
| F. Beastall | 1,243 | Gill & Son* | 1,120 |
| J. Athron, Jun. | 1,234 | | |

* Accepted.
[All of Doncaster.]

DONCASTER.—For the erection of new schools, fence-walls, play-sheds, and outbuildings at Wheatley, for the Wheatley School Board. Messrs. Athron & Beck, architects, Doncaster. Quantities by the architects:—

| | Schools. | Extras. | Total. |
|---|---|---|---|
| B. Wortley | £3,490 0 | £566 0 | £4,056 0 |
| J. Athron | 3,495 0 | 557 0 | 4,052 0 |
| S. Beastall | 3,410 0 | 575 0 | 3,985 0 |
| F. Beastall | 3,292 5 | 556 0 | 3,850 5 |
| W. Anelay | 3,268 0 | 530 0 | 3,808 0 |
| D. Gill & Son | 3,202 0 | 500 0 | 3,702 0 |
| Arnold & Son | 3,259 0 | 575 0 | 3,834 0 |
| Mullins & Richardson* | 3,071 8 | 318 12 | 3,390 0 |
| Mottram | 3,100 0 | Incomplete. | |

* Accepted.
[All of Doncaster.]

DONCASTER.—For the erection of new co-operative stores, Goldthorpe-lane Ends, for the Doncaster Mutual Co-operative and Industrial Society, Limited. Messrs. Athron & Beck, architects, Doncaster. Quantities by the architects:—

| | | | |
|---|---|---|---|
| Duncan & Jones | £2,497 6 10 | H. Arnold & Son, Doncaster * | £2,165 0 0 |
| J. Athron, jun. | 2,470 0 0 | Mullins & Richardson | 2,153 0 0 |
| B. Wortley | 2,304 18 0 | Brown & Hamilton | 1,994 0 0 |
| F. Beastall | 2,196 0 0 | | |

* Accepted.

DONCASTER.—Accepted for building new business premises, St. Sepulchre-gate, Doncaster, for Mr. Preston Scarborough. Messrs. Athron & Beck, architects, Doncaster:—
S. Beastall, Doncaster ..... £1,720

DONCASTER.—Accepted for extension of new Co-operative Buildings, Station-road, Doncaster, for the Doncaster Mutual Co-operative and Industrial Society, Limited. Messrs. Athron & Beck, architects, Doncaster:—
H. Arnold & Son, Doncaster* ..... £3,150
* Accepted subject to schedule.

DONCASTER.—Accepted for extension of coal shed at Hexthorpe, for the Doncaster Mutual Co-operative and Industrial Society, Limited. Messrs. Athron & Beck, architects. Quantities by the architects:—
H. Arnold & Son, Doncaster ..... £520

EPSOM.—For extension of the waterworks, comprising the construction of covered service reservoir, pumping and water mains, sinking boreholes, &c., for the Epsom District Council. Messrs. G. & F. W. Hodson, engineers, Loughborough and Westminster:—

| | | | |
|---|---|---|---|
| Corres, Martin, & Co. | £17,405 | H. Weldon | £12,426 |
| J. F. Price | 13,700 | B. Cooks & Co. | 12,390 |
| J. Tomlinson | 13,605 | W. Cunliffe, Kingston-on-Thames* | 12,080 |
| S. Kavanagh | 13,190 | | |

* Accepted.

HASTINGS.—For alterations to No. 24, George-street, Hastings, for the International Tea Company's Stores, Limited. Mr. William Cooper, architect, 21, Havelock-road, Hastings:—

| | | | |
|---|---|---|---|
| Mason & Co. | £796 | Cox Bros. | £572 |
| T. Salter | 749 | Vigor & Co. | 550 |
| Eldridge & Cruttenden | 738 | A. H. White, St. Leonards* | 486 |
| H. E. Cruttenden | 690 | | |

* Accepted.

HEREFORD.—For alterations and improvements to St. Peter's Schools. Mr. G. H. Godsell, architect, Hereford:—

| | New Offices. | Cottages. | Total. |
|---|---|---|---|
| J. Davis | £582 12 | £180 0 | £762 12 |
| W. Powell | 595 0 | 158 0 | 753 0 |
| J. Lloyd | 586 7 | 139 10 | 725 17 |
| W. Bowers & Co. | 471 0 | 191 0 | 662 0 |
| Beauan & Hodges | 530 0 | 130 0 | 660 0 |
| W. P. Lewis & Co.* | 525 0 | 135 0 | 660 0 |

* Accepted.

HIGHAM FERRERS (Northants).—For the erection of two houses, for Mr. W. Spong. Mr. H. Adnitt, architect, High-street, Rushden. Quantities by the architect:—

| | | | |
|---|---|---|---|
| Grant | £663 0 | T. Wilmott | £481 10 |
| Tibbett and Pratt | 635 0 | F. Henson | 465 0 |
| T. Swindall | 508 0 | W. T. Whitbread | 460 0 |
| G. Henson | 490 0 | F. Ireson | — |

HOLMER (Herefordshire).—Accepted for the erection of four new cottages, for Mr. T. St. George Fountaine. Mr. G. H. Godsell, architect, Hereford:—
E. W. Wilks ..... £410

HORSHAM.—For additions to Hills Place, Horsham, for Mr. R. F. Bacchus. Mr. William Buck, architect, Horsham:—

| | | | |
|---|---|---|---|
| Peters & Son | £805 | Cook & Sons | £685 |
| G. Potter | 768 | G. Sharp, Horsham* | 665 |
| Potter Bros | 722 | | |

*Accepted.
[All including patent tubular bricks for external walls.]

HULLAVINGTON (Wilts).—For erecting a lych gate at Hullavington Church, Wilts, for Mr. Meredith brown. Mr. Harold Brakspear, architect, Corsham, Wilts:—
Downing & Rudman, contractors, Chippenham ..... £134 16

KIRKBY LONSDALE.—For the erection of cottages. Mr. Jno. Kassell, architect, Kirkby Lonsdale. Quantities by Mr. Lewen C. Kassell, Kirkby Londsdale:—

*Detached Cottages.*

| | |
|---|---|
| *Masonry, Plastering, and Slating.*—John F. Airey | £20 |
| *Joinery and Carpentry.*—John Brierley | 60 |
| *Plumbing, Glazing, and Painting.*—Anthony Monhouse | 20 |

*Two Semi-Detached Cottages.*

| | |
|---|---|
| *Masonry, &c.*—John F. Airey | £300 |
| *Joinery, &c.*—John Brierley | 103 |
| *Plumbing, &c.*—A. Monhouse | 30 |

LEMINGTON-ON-TYNE.—For making-up eighteen new streets, for the Newburn Urban District Council. Mr. H. W. Taylor, engineer, Newburn-on-Tyne. Quantities by engineer:—

| | | | |
|---|---|---|---|
| J. Howe & Co. | £3,966 | J. McGregor | £2,560 |
| W. Cumming | 2,857 | G. Maughan | 2,302 |
| J. Wm. Robson | 2,684 | G. E. Simpson | 2,386 |

[Engineer's estimate, £2,430.]

LONDON.—For stables and depot at Bowes Park, N., for the London Parcels Delivery Company. Mr. H. Poston, architect:—

| | | | |
|---|---|---|---|
| Mowlem & Co. | £4,884 | J. Bentley & Son | £4,065 |
| Brown & Sweetland | 4,854 | W. Shurmur | 3,999 |
| Burman & Son | 4,400 | Killby & Gayford | 3,986 |
| Courtney & Fairbairn | 4,279 | G. E. Todd | 3,777 |
| Jarvis & Son | 4,214 | | |

LONDON.—For extension of premises at Tudor-street, E.C., for the Argus Printing Co., Limited. Mr. C. Val Hunter, architect:—

| | | | |
|---|---|---|---|
| W. Downs | £5,269 | Holliday & Greenwood | £4,877 |
| H. & H. F. Higgs | 5,151 | W. Shurmur | 4,743 |
| W. H. Lascelles & Co. | 5,039 | Patman & Fotheringham | 4,661 |

LONDON.—For alterations and additions at the "Earl Amhurst," Amhurst-road, Hackney. Messrs. Eedle & Meyers, architects:—

| | | | |
|---|---|---|---|
| E. Toms | £1,913 | Godfrey & Son | £1,845 |
| Burman & Sons | 1,893 | W. H. Lascelles & Son | 1,838 |
| Antil & Co. | 1,873 | Goodall & Son | 1,800 |
| Edwards & Medway | 1,800 | Spencer & Co. | 1,730 |
| W. Shurmur | 1,895 | Sheffield Bros. | 1,939 |

LONDON.—For partial restoration and enlargement of St. Mary's Church, Bow-road. Messrs. W. A. Hills & Son, architects:—

| | | | |
|---|---|---|---|
| Brown, Son, & Blomfield | £3,209 | W. Shurmur | £2,853 |
| Perry & Co. | 3,053 | J. Woodward | 2,693 |
| Mowlem & Co. | 2,940 | | |

LONDON.—For underground convenience, for the Hackney Vestry. Mr. J. Lovegrove, Surveyor:—

| | | | |
|---|---|---|---|
| Finch & Co. | £880 | Barrett & Power | £627 |
| Kavanagh | 723 | W. Shurmur | 600 |

LONDON.—For alterations to the "Montpelier Tavern," Queen's-road, Peckham, for Mr. Brabazon. Mr. James Warne, architect:—

| | | | |
|---|---|---|---|
| King & Son | £950 | J. Tyman | £743 |
| Simpson & Cove | 840 | W. H. Coates | 735 |
| Gardner & Levelock | 765 | | |

LONDON.—For additions and general repairs to 24, Newman-street, for Mr. George Harris, Oxford-street. Mr. John Slater and Messrs. New & Son, architects:—

| | | | |
|---|---|---|---|
| Holloway Bros. | £1,880 | Gould & Brand | £1,580 |
| Scrivener & Co. | 1,644 | F. Mark | 1,569 |
| E. Harris & Sons | 1,589 | Tennant & Co. | 1,560 |

LONDON.—For additions and alterations to the "Spread Eagle" public-house, High-street, Homerton, E., for Mr. E. A. King. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C.:—

| | | | |
|---|---|---|---|
| W. Shurmur | £752 | S. R. Lamble* | £727 |
| G. Fuller | 763 | Mark Patrick & Son | 680 |
| Killby & Gayford | 735 | | |

* Accepted.

LONDON.—For alterations to the "Clerkenwell Tavern, Exmouth-street, W.C., for Mr. F. E. Osborne. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C.:—

| | | | |
|---|---|---|---|
| J. Pugh | £6,511 10 | Killby & Gayford | £5,654 0 |
| R. E. Worsley & Co. | 6,077 0 | S. R. Lamble | 5,344 0 |
| Mark Patrick & Son | 5,809 0 | W. King & Son* | 4,899 0 |

* Accepted.

LONDON.—For additions and repairs to dwelling-house, Usher-road, Old Ford, E., for Messrs. J. Deaton & Sons. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C.:—

| | | | |
|---|---|---|---|
| S. R. Lamble | £537 | T. Freeman & Son * | £335 |
| G. W. Beale | 359 | | |

* Accepted.

LONDON.—For the erection of twelve shops and dwelling-houses, Woolwich-road, Greenwich, for Mr. W. A. J. Hensler. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C.:—

| | Without Basement. | With Basement. |
|---|---|---|
| E. Chubb | £10,697 | £12,730 |
| S. R. Lamble | 6,314 | 7,343 |
| T. Freeman & Son (accepted) | 5,318 | 6,223 |

LONDON.—For alterations and additions to the "Harwood Arms," Walham-grove, Fulham, for Mr. J. R. Knox. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C.:—

| | | | |
|---|---|---|---|
| T. Freeman & Son | £1,760 | W. King & Son | £1,465 |
| Killby & Gayford | 1,522 | T. R. Lamble | 1,339 |
| Mark Patrick & Son | 1,509 | T. E. Mitchell (accepted) | 1,240 |

LONDON.—For alterations and repairs to the "Milford Arms," Park-lane, Tottenham, for Messrs. Combe & Co., Limited. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C.:—

| | | | |
|---|---|---|---|
| A. Foster | £573 0 | Jason, Cutler, & Co. | £565 0 |
| E. Chubb* | 569 10 | | |

* Accepted. † Withdrawn.

LONDON.—For extension of premises of the City of Dublin Bottling Co., Hambury-street, London Fields. Mr. G. Sherrin, architect:—

| | | | |
|---|---|---|---|
| Faulkner & Son | £1,333 | Otway | £1,215 |
| Outhwaite | 1,247 | Harris & Wardrop | 1,193 |
| Keason | 1,129 | Godfrey & Son | 1,177 |

LONDON.—For the erection of twenty-six small houses at Fulham. Mr. W. H. Tucker, architect, Bank-buildings, Walham Green, S.W.:—

| | | | |
|---|---|---|---|
| Finn & Son | £6,812 4 0 | J. Edwards | £4,134 0 0 |
| W. Hamilton | 5,330 0 0 | J. H. Walker | 4,101 13 4 |
| W. J. Cottle | 4,550 0 0 | C. W. Bathurst | 3,950 0 0 |
| J. Gimson | 4,420 0 0 | [Architect's estimate, £4,000.] | |

LONDON.—For alterations at Nos. 2 and 3, Holborn-circus, E.C., in converting and fitting the premises for Lloyd's Bank, Limited. Messrs. Segrave, Bowett & Taylor, architects, 116 and 117, Holborn, E.C. Quantities by Mr. William Thompson, 145, Cannon-street, E.C.:—

| | | | |
|---|---|---|---|
| G. Wagstaff & Son | £5,857 | W. Johnson & Co., Limited | |
| B. E. Nightingale | 4,827 | Wandsworth Common* | £4,539 |
| Staines & Son | 4,579 | | |

* Accepted.

LONDON.—Accepted for the erection of a furniture depository, Deptford, for Messrs. Peppercorn Bros., at Deptford Bridge. Mr. John Jas. Downes, architect, 199, Lewisham High-road:—
Saml. J. Jerrard, at a reduced estimate of ..... £5,970
[In limited competition.]

LONDON.—For shop fronts at 203, Lewisham High-road, New Cross, S.E., for Messrs. Plummer & Co., Limited. Mr. John Jas. Downes, architect, 199, Lewisham High-road:—

| | | | |
|---|---|---|---|
| Powditch & Co. | £380 | Drew & Cadman | £283 |
| Parnall & Co. | 325 | W. Salter | 282 |
| Sage & Co. | 300 | | |

LOUGHOR (Wales).—For the erection of Independent chapel, Brynteg. Mr. T. Arnold, architect, Castle Buildings, Llanelly. Quantities by the architect:—

| | | | |
|---|---|---|---|
| Morris, Phillips, Morgan, & Thomas | £1,926 18 6 | Thomas Williams | 1,694 10 0 |
| David Rees | 1,893 0 0 | J. Davies & Son | 1,645 12 8 |
| J. D. Williams | 1,890 0 0 | Davies & Rees | 1,630 0 0 |
| Thomas Thomas | 1,864 7 6½ | Elias Morgans | 1,587 2 6 |
| David Morgans | 1,701 19 8 | Walters & John, Morriston, Swansea* | 1,540 0 0 |
| Lewis Jenkins & Fry | 1,698 10 0 | | |

*Accepted.

NEW BRIGHTON.—For the erection of the New Brighton tower and buildings. Messrs. Maxwell & Tuke, architects, Manchester:—

*Steel and Iron Work in Tower and Buildings.*

| | |
|---|---|
| Pearson & Knowles | £40,000 0 |
| Heenan & Froude | 39,020 0 |
| Patent Shaft and Axle Tree Company | 38,922 0 |
| Handyside & Co., Limited, Britannia Iron Works, Derby (accepted) | 38,809 0 |
| Maudsley, Sons, & Field, Limited | 37,703 15 |

*Main Buildings Surrounding the Tower.*

| | | | |
|---|---|---|---|
| Holme & Green | £53,750 0 0 | T. & W. Meadows | £45,208 11 8 |
| Haigh & Co. | 48,500 0 0 | John Gourley | 45,055 0 0 |
| W. Tomkinson & Sons | 47,000 0 0 | Wm. Brown & Sons | 39,400 0 0 |
| S. & J. Whitehead | 45,750 0 0 | W. A. Peters & Sons, Rochdale (accepted) | 38,681 0 0 |
| J. Henshaw & Sons | 40,035 0 0 | | |

*Concrete Work.*

| | | | |
|---|---|---|---|
| Hindley & Co. | £11,557 0 0 | Hamor Lockwood, Manchester* | £8,416 2 5 |
| Stuart's Granolithic Co. | 9,642 12 0 | S. Moreton | 7,856 0 0 |

* Accepted.

*Terra Cotta Work.*

| | | | |
|---|---|---|---|
| The Leeds Fireclay Co. | £5,934 4 0 | Monk & Newell | £4,815 0 0 |
| Ruabon Brick & Terra Cotta Co. | 5,274 0 0 | Ruabon Brick & Terra Cotta Co. | 4,180 0 0 |
| Ruabon Coal & Coke Co. | 4,732 5 6 | Doulton & Co., London* | 4,100 0 0 |
| J. C. Edwards | 4,542 0 0 | Accrington Brick & Tile Co. | 3,822 0 0 |
| Alfred Whitehead | 4,258 0 0 | Jabez Thompson | 3,485 0 0 |

* Accepted.

NEW ELTHAM.—For alterations and additions to the "The Bee Hive Inn," New Eltham, for Mr. C. N. Kidd. Mr. R. A. Lewcock, architect. Quantities supplied by Messrs. Heeis & Wrightson:—

| | | | |
|---|---|---|---|
| Welsh & Son | £4,033 | Scharien & Co. | £3,760 |
| J. O. Richardson | 6,022 | Courtney & Fairburn | 5,758 |
| Lascelles | 5,960 | Spencer & Co. | 5,693 |
| Killby & Gayford | 5,598 | Knight | 5,481 |
| Ashby Bros. | 5,827 | B. E. Nightingale | 5,387 |
| Edwards & Medway | 5,810 | Barlow & Roberts | 4,904 |

NEW MILLS (Derby).—For the execution of sewerage works, Birch Vale, for the Urban District Council. Messrs. Spinks & Beever, engineers, Manchester and Leeds. Quantities by the engineers:—

| | | | |
|---|---|---|---|
| J. Schofield & Sons | £3,587 12 5 | Allen Taylor, Hazel Grove, Stockport* | £2,644 17 2 |
| H. H. Barry | 3,321 0 0 | Frank Eyre | 2,580 17 8 |

* Accepted.

PARKESTON.—For the erection of shops, &c., for the Harwich and Dovercourt Co-operative Society. Messrs. Goodey & Cressall, architects, Victoria Chambers, Colchester:—

| | | | |
|---|---|---|---|
| Everett & Son | £1,530 | Ed. Saunders | £1,434 |
| W. Chambers | 1,530 | Smith, Beaumont, & Dawson, Harwich* | 1,330 |
| F. Dupont | 1,475 | | |

* Accepted.

RISCA (Mon.).—For rebuilding the "Fox and Hounds" inn, for Messrs. Rogers, Limited. Messrs. Swash & Bain, architects, 3, Friar's-chambers, Newport. Quantities by architects:—

| | | | |
|---|---|---|---|
| D. W. Pugh | £953 10 | I. Jenkins | £795 0 |
| J. Linton | 835 0 | C. H. Reed, Newport* | 787 0 |
| D. J. Davies | 830 0 | T. Fraser | 721 0 |
| Lawson & Co. | 797 0 | | |

*Accepted.

RUSHDEN.—For erecting three houses and shops, Church-street, Rushden, for Mr. J. Northern. Mr. H. Adnitt, architect. Quantities by the architect:—

| | | | |
|---|---|---|---|
| Whittington & Tomlin | £1,115 0 | Bayes & Son, Rushden* | £1,067 10 |
| Berrill's | 1,095 0 | W. T. Whitbread | 1,039 10 |
| Hacksley Bros. | 1,095 0 | | |
| T. Wilmott | 1,081 10 | | |

* Accepted.

RUSHDEN. — For additions to Primitive Methodist Chapel, Fitzwilliam-street, Rushden. Mr. H. Adnitt, architect. Quantities by the architect:—

| | | | |
|---|---|---|---|
| T. Swindall | £576 0 | Bayes & Son | £526 0 |
| Hacksley Bros. | 559 0 | F. Sparrow | 526 0 |
| F. Henson | 536 0 | T. Wilmott | 525 10 |
| Whittington & Tomlin | 527 10 | T. & C. Berrill* | 520 0 |

* Recommended for acceptance.

SEAFORD.—Accepted for the erection of a house in Sutton Drove-road, Seaford, for Mr. William Lambe. Mr. William Cooper, architect, 21, Havelock-road, Hastings:—

W. Wilkinson, Seaford ..... £589 4

SEAFORD.—For the erection of business premises, workshops, and dwelling house in Claremont-road, Seaford, for Mr. Robert Lambe. Mr. Wm. Hooper, architect, 21, Havelock-road, Hastings:—

| | | | |
|---|---|---|---|
| M. Martin | £1,198 | Morling | £955 |
| J. Peerless | 1,130 | Berry | 936 |
| W. Wilkinson | 1,058 | Bruce & Co., Hastings* | 898 |

* Accepted.

SEEND (Wilts).—Accepted for alterations and additions to Cleeve House, Seend, Wilts, for Mr. W. H. Bell, J.P. Mr. Harold Brakspear, architect, Corsham, Wilts:—

James Burgess, contractor, Westbury ..... £1,380

UPTON PARK.—For building two cottages at Shrewsbury-road, Upton Park, Essex, for Mr. J. F. Jones. Mr. F. W. Howles, surveyor, 12, Fournier-street, Spitalfields:—

| | | | |
|---|---|---|---|
| Johnson Bros. | £949 0 | J. F. Holliday | £683 10 |
| J. Rusher & James | 815 0 | | |

WALTHAM CROSS.—For the extension of shop and warehouse, for Mr. O. S. Clark. Mr. F. W. Adams, architect, Finsbury Circus Buildings, 28, Eldon-street, E.C. Quantities supplied:—

| | | | |
|---|---|---|---|
| Balaam Bros. | £1,560 | J. Bentley | £1,415 |
| W. Lawrence | 1,469 | W. Gardener, Waltham Abbey (accepted) | 1,220 |
| Fairhead & Sons | 1,449 | | |

WELLINGBOROUGH.—For the erection of a pair of cottages near sewage works, for the Urban District Council. Mr. E. Sharman, Surveyor, Council Offices, Wellingborough:—

| | | | |
|---|---|---|---|
| C. W. Abbott | £520 0 | W. Coates | £490 0 |
| W. Berrill | 509 0 | W. I. Harrison | 487 0 |
| T. H. Dorman | 498 0 | R. Marriott | 485 0 |
| W. Stevens | 496 10 | | |

WIMBLEDON.—For additions to No. 29, Merton-road, for Mr. H. Knight. Mr. Robert J. Thomson, architect, 64, Hill-road, Wimbledon:—

W. T. Blake ..... £182 | H. Johnson (accepted) ..... £160

YNISFAIO (near Treherbert).—For the erection of a vicarage at Ynisfaio, for Mrs. Llewellyn, of Baglan Hall, Briton Ferry. Mr. George E. Halliday, architect, 14, High-street, Cardiff. Quantities by Mr. John W. Roger, 14, High-street, Cardiff:—

| | | | |
|---|---|---|---|
| William & Thomas | £1,366 11 10 | Ed. Jones, Treorky* | £1,159 0 0 |
| J. D. Williams | 1,272 10 0 | E. C. Newby | 1,071 0 0 |
| D. Thomas | 1,254 6 3 | Jones & Maddren | 1,069 2 1 |
| Ed. Davies & Sons | 1,214 10 10 | Newman & James | 1,055 6 2 |
| Wm. Lissaman, Jun. | 1,175 0 0 | | |

* Accepted.

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